Canada Thistle

Spotted Knapweed

Leafy Spurge

USDA Forest Service

Gallatin National Forest

NOXIOUS WEED CONTROL

Environmental Impact Statement Draft

June 1986

DRAFT ENVIRONMENTAL IMPACT STATEMENT

Gallatin National Forest

Madison, Meagher, Gallatin, Park, and Sweetgrass Counties, Montana

Lead Agency:	U.S.D.A. - Forest Service
Cooperating Agencies:	No other Agencies (State or Federal)
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Abstract: This Draft Environmental Impact Statement documents the analysis of four alternatives, including "no action," which were developed for the management and treatment of noxious weeds on the Gallatin National Forest. The Gallatin National Forest covers 1,735,412 acres, of which, approximately 2,800 acres are infested with dense stands of noxious weeds and about 143,000 acres are lightly infested.

The alternatives considered provide different approaches to weed management resulting in different levels of control. These alternatives are: (1) No Action; (2) Cultural and Biological control; (3) Chemical and Biological control; (4) Integrated Pest Management. Alternative (4) is the Forest Service preferred alternative. This alternative provides for treating noxious weeds in an integrated pest management approach using a combination of chemical, cultural, and biological means. Chemical control would be emphasized, using herbicides applied on the ground to target weeds by truck mounted or hand-held nozzles or solid pellets.

Please retain your copy of this Draft Environmental Impact Statement (EIS). If changes to the Draft EIS in response to comments are minor and are confined to factual corrections or explanations why the comments do not warrant further agency reponse than only the comments, the responses and the changes will be circulated and not the Final EIS. (40 CFR 1503.4(c)).

The Absaroka-Beartooth Wilderness and the Lee Metcalf Wilderness will not receive any treatment with herbicide until the Regional Forester has approved a course of action specifically for them. Hand grubbing would be permitted at this time

Comments regarding this statement should be sent to the Forest Supervisor, Gallatin National Forest, P.O. Box 130, Federal Building, Bozeman, Montana, 59771. Comments must be received by August 15, 1986.

SUMMARY

This Draft Environmental Impact Statement (EIS) describes and analyzes the environmental impacts of implementing a program of controlling noxious weeds on public land administered by the United States Forest Service. These lands are administered by the Gallatin National Forest in the Gallatin, Madison, Meagher, Park, and Sweetgrass counties within the State of Montana. Noxious weeds are rapidly spreading throughout the State of Montana, causing a variety of ecological, social and economic impacts to agricultural lands, forest and rangeland, wildlife lands, watersheds, and other resources. About 146,000 acres of lands containing noxious weeds have been identified on the Gallatin National Forest. These lands range from 107,000 acres containing occasional noxious plants to 2,800 acres of dense stands of noxious weeds.

Several laws provide the authority for this proposal and date from the Granger-Thye Act of 1925 to the Rangeland Improvement Act of 1978. The term "noxious weeds" is a legal designation and not a biological term. State laws provide for designation of certain plant species as "noxious" and require landowners to control them. Recent legislation enacted within the state of Montana make it mandatory for landowners to provide management plans and alternatives for the control and eradication of these noxious weeds.

The Gallatin National Forest has organized an interdisciplinary team to analyze the noxious weed problem in accord with Forest Service policies and the National Environmental Policy Act. The scoping phase of the environmental analysis process revealed specific issues involved in noxious weed management.

The issues of greatest public concern were: (1) the human health risk associated with chemical treatment, (2) the losses to vegetative productivity associated with noxious weed infestations, (3) the rate of spread of noxious weeds, (4) the need to cooperate with other agencies and landowners in weed control, (5) effects on threatened and endangered animals and plants, (6) the need to inform forest visitors and Forest Service personnel of the noxious weed problem, (7) the legal obligation of the Forest Service to maintain, enhance and preserve the natural resource within its changes.

Alternatives Considered

To fully consider the issues and concerns that were identified during the scoping process a range of alternatives were developed by the interdisciplinary team, including: (1) no action, (2) cultural and biological control, (3) chemical and cultural control, and (4) integrated pest management. A brief description of each alternative follows.

Alternative 1 - - No Action

Under this alternative no attempt will be made to control or contain the spread of noxious weeds from coming onto or leaving National Forest System lands. Any control would only be a natural function of the environment with no planned intervention by land manager.

Alternative 2 - - Cultural and Biological Control
Mechanical methods (tillage, mowing, and hand grubbing) would be the primary tools used to control noxious weeds under this alternative. In addition to mechanical methods, prompt revegetation of soil disturbed by road construction, building sites and timber harvest activities would be implemented. Biological control involves using natural insect and disease enemies (parasites, predators or pathogens) that will attack individual noxious plant species to retard growth or prevent seed formation. At the present, the Leafy Spurge Hawk Mouth, the Canada Thistle Stem Mining Weevil and two Knapweed Seed-Head Gall Flies have been introduced into the environment. This alternative would provide for continued monitoring of these bio-agents and new releases as available.

Alternative 3 - - Chemical and Biological Control
Noxious weed control would be accomplished primarily by the ground application of the herbicides picloram and 2,4-D. Ground application of herbicides would be accomplished mostly by spot application from hand-held nozzles, either from vehicle mounted sprayers or backpack tanks. Biological control under alternative (3) would be the same as under alternative (2) above.

Alternative 4 - - Integrated Pest Management (Preferred Alternative)
Alternative (4) would involve an integrated pest management approach to noxious weed control in coordination with [illegible] lands. Alternative (4) provides for the application of integrated pest management principles, but emphasizes chemical control as the primary method. Biological control efforts including monitoring current control efforts and introducing new biocontrol agents will be coordinated with the Bozeman Insect Laboratory of the U.S.D.A. Agriculture Research Service (location Bozeman, Montana). Control of Leafy Spurge with sheep grazing at several sites will also be attempted.

Cultural weed control by manual hand grubbing would be applied to weeds in wilderness areas, within rare plant habitat and other selected sites. Chemical control under alternative (4) would be applied on approximately 275 acres in 1987-1990. As in alternative (3) the herbicides 2,4-D and picloram would be spot applied to individual weeds by hand-held nozzle or pellet form. An active public information program would be a implemented under this alternative also.

AFFECTED ENVIRONMENT

The principal noxious weeds on the Gallatin National Forest are Leafy Spurge, Spotted Knapweed, Canada Thistle, Musk Thistle, Whitetop, Dalmation Toadflax, Hounds Tongue,and Yellow Toadflax. Areas affected by noxious weeds include forest land, rangeland, rights-of-ways, riparian zones and occupancy sites. Approximately 146,000 acres of forest land contain noxious weed infestations. This acreage includes 107,900 acres containing occasional plants, 37,900 acres of widely scattered infestation and 2,800 acres of dense infestation.

The forest has three threatened and endangered animal species: grizzly bear, bald eagle, and the peregrine falcon. All three species habitiat occurs on all five Ranger Districts on the forest. A biological evaluation has been conducted to analyze the effects of noxious weed control on these threatened and endangered species.

The Gallatin National Forest consists of 1,735,412 acres of National Forest system lands, with 415,826 acres of other ownership with the forest boundary. The Forest consists of six mountain ranges and one high-altitude plateau. Slopes on the Forest are characteristically steep. Climatic zones vary with altitude from the semiarid and relatively warm valley bottoms through a broad range of cool, moist coniferous forests to the subalpine and alpine regions characterized by high altitude rocklands.

About 1.3 million acres of the Gallatin's total 1.7 million acres are forested. Primary commercial tree species on the Forest are lodgepole pine, Douglas-fir, alpine fir, and spruce. Whitebark pine stands occur on the Forest near the timberline. Bunchgrass, forbs, and related species of flora comprise the more valuable forage on the Forest's rangelands. Elk, deer, and commercial livestock all use these rangelands in different places or at different times. Riparian vegetation along streams or wetlands is of high value on the Gallatin to provide habitat, forage, and browse for wildlife and domestic livestock; to reduce sedimentation in streams; and to retard runoff that might otherwise contribute to flooding.

The Gallatin National Forest exerts a significant economic influence on Gallatin, Park, and Sweetgrass counties. Towns that are affected by activities on the Forest include Bozeman, Livingston, West Yellowstone, Gardiner, and Big Timber. The area-of-influence of the Forest had a population of 63,000 persons in 1980.

In 1980, 2,022,000 recreation visitor days were recorded on the Forest. Thirty-four percent of this use was at developed recreation sites and 66 percent was dispersed use, such as hiking, camping, and backpacking. Dispersed use occurs in wilderness and nonwilderness areas. Future recreation use is expected to increase.

The Gallatin National Forest contains the greater part of two wilderness areas, the Absaroka-Beartooth and Lee Metcalf wilderness. The Forest also contains the congressionally designated Cabin Creek Recreation and Wildlife Area. In addition, 12 roadless areas totaling 637,600 acres had been inventoried on the Forest as of September 1984.

The Gallatin Forest provides habitat for approximately 330 wildlife species. Elk herds, both resident and migratory, and a large native population of mule deer are the most abundant big game species. The Forest also has stable populations of moose, bighorn sheep, mountain goats, black bear, and white-tailed deer.

Fish found on the Gallatin include cutthroat, rainbow, brown, golden, and brook trout, rainbow-cutthroat, hybrids, arctic graylings, and mountain whitefish. The Forest contains 1,052 miles of fishing streams. Three major rivers that cross the Forest--the Gallatin, Madison, and Yellowstone, merit national attention as "blue ribbon" trout streams.

At present, about 164 permittees are grazing livestock on 148 active grazing allotments on the Gallatin National Forest. These allotments constitute approximately 165,800 acres of rangeland. The current domestic livestock grazing level on the Forest Service is 38,920 Animal Unit Months per year from permanent range.

At present, about 428,000 acres of the Gallatin National Forest are classified as available and capable for timber management activities. The Forest now has 314,000 acres in the timber base. About 33,600 acres of productive Forest land are presently unavailable for timber and other wood products because they are being studied for wildermess suitability under the Montana Wilderness Study Act. The annual harvest from the Gallatin within the past 10-year period has ranged from 7 to 25 million board feet, averaging 13.2 MMBF cut per year. The annual sell in recent years has increased due to efforts to salvage lodgepole pine killed or threatened by a mountain pine beetle epidemic.

The Gallatin National Forest produces about 2,028,000 acre-feet of water annually. This water yield is greatest during the period of spring runoff. The ability of watersheds to moderate this runoff is important for controlling erosion, assuring water quality, and reducing the hazard of flooding. Riparian vegetation on the Gallatin is important in stabilizing streambanks and achieving these benefits.

Major storage reservoirs on the Forest include Hyalite and Hebgen lakes. There are three municipal watersheds on the Gallatin Forest. Bozeman is the largest municipality served from waters originating on the Forest.
The Forest also has 91 special use permits for water-related facilities, such as water lines, stock watering facilities, reservoirs, and irrigation ditches. Streamflow arising on the Forest is used to irrigate 439,000 acres of cropland and hayland in five counties.

The Forest currently has 807 miles of Forest development roads on its inventoried system. Approximately 250 miles are maintained annually by the Forest Service. The Forest makes available 1,853 miles of trails for riders and hikers. About 28 percent of the trail system is presently in need of repair or relocation. Developed recreation facilities on the Forest include campgrounds (37), picnic areas (14), developed downhill ski areas (2), boat launches (5), and a visitor information center at Earthquake Lake. The Forest also has a number of existing powerline corridors crossing Forest Service land. These corridors include powerlines through Flathead Pass, a powerline up the Gallatin Canyon, and several powerlines in the Hebgen area serving the town of West Yellowstone.

ECONOMIC IMPLICATIONS OF NOXIOUS WEEDS

Spotted Knapweed ranks as the number one weed problem on rangeland in Montana. It reduces livestock and big game forage, damages wildlife habitat, and can double the amount of soil erosion from sites where it invades rangeland. Knapweed is estimated to cause an annual loss of forage valued at 4.5 million dollars in Montana. Leafy spurge is considered as the most persistent of the identified noxious weeds. Its inhabitance creates the loss of hay and beef cattle production, wildlife habitat, and other resource values.

ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVES

Alternative 1 - - No Action

Left unchecked the noxious weeds would continue to spread on the Forest, and the cost of weed control would more than double in 5 years. Forage production would decline on the weed infested range areas, reducing forage available for livestock and wildlife.

There are toxins produced in leafy spurge and spotted knapweed which limit the growth of competing plants and often result in the development and perpetuation of a weed monoculture. The most drastic biological effect that this could have would be the elimination of the rare plant species. As knapweed and leafy spurge increase and crowd out more favorable forage plants, the habitat for many wildlife species would likely deteriorate. Impacts to fisheries would be in the form of potential increases of sedimentation and decreases of bank stability assciated with the noxious weeds crowding out more desirable vegetation.
There would be no human health risk associated with the No Action alternative.

Alternative 2 - - Cultural and Biological Control

In the long-term, the most cost-effective control of noxious weed species will likely come from introduction of biological agents that limit the aggressiveness and range of these weeds. However, development of biological control is a very slow process. The biological control insects currently available are not expected to adequately reduce knapweed, leafy spurge or other noxious weed problems on the Gallatin National Forest in the near future. Until additional bio-agents are introduced that are effective in controlling the noxious weeds on the Forest, biological control will likely have only minimal impacts on noxious weed infestations.

Intensive cultivation necessary to control noxious weeds is not practical on the steep, rocky range and forest land of the National Forest. Only hand grubbing and some roadside mowing could be used. These treatments would have to be repeated annually for an indefinite period to control the weeds. The cost of cultural methods as the sole treatment is several times the cost of any of the other alternatives. In addition, mechanical treatment is not effective against rhizomatous plant which can spread vegetatively (regenerating from rhizomes). Mechanical treatment of leafy spurge can increase its rate of spread under some conditions. Soil disturbance and erosion would increase more under mechanical weed control than under other alternatives. Mechanical treatment by grubbing could potentially disturb unindentified archeological resources.

The human health risk associated with the mechanical treatment alternative would be the safety hazard for workers using small hand tools in grubbing out weeds, and for operating mowing and tillage equipment. There would be little or no hazard to the general population.

Mechanical treatment of some weeds such as knapweed would improve the forage resources for livestock in the long run. However, there would be a high risk of the reinvasion of noxious weeds on the disturbed soil. Reseeding with favored plant species can reduce this risk. Overall the forage improvement under this alternative would be intermediate to Alternatives (1) and (4).

Alternative 3 - - Chemical and Biological Control

Research shows that the application of herbicide can provide effective control of the target weeds. The herbicide picloram may remain in the soil, killing weeds for two or more years after application.

Following herbicide treatment on the project area, forage production would be rapidly improved on target acres of rangeland. The proposed chemical treatment is expected to cause only a short-term decline of diversity in wildlife habitat cover, by favoring the growth of grasses over broadleaf forbs and shrubs on the area treated. There are no known Federally listed threatened and endangered plants on the Gallatin National Forest. Unidentified populations of threatened and endangered plants could be susceptible to any impacts described for terrestrial vegetation. Direct effects of injury or death to plants could immediately eliminate a species in a portion of its range. Increased competition from aggressive noxious weed species could also eliminate a species.

The herbicides that are proposed for use in chemical control (2,4-D and picloram) both have a low level of toxicity. The procedure of spot application makes the risk of any adverse effects on wildlife species very low. Herbicide concentration on vegetation would be below levels that affect grazing and browsing animals. Threatened grizzly bear occupied habitat would be involved in treatment with herbicides. However, because the treatment is largely roadside rights-of-way, the area affected is of low habitat effectiveness for the grizzly bear. Therefore, no adverse effects would be expected on the grizzly bear or other threatened or endangered species. Small quantities of herbicides could enter streams through drift, but limiting spraying to wind conditions of 10 mph or less will minimize this drift.

Some herbicides could also enter streams in surface runoff or through erosion of previously treated soils. Where streamflow results from thunderstorms, surface runoff may flush herbicide residuals into streams in detectable levels. under resonable foreseeable conditions the herbicide concentration would be below levels that affect fish survival. The human health hazard for Alternative (3) is similar to Alternative (4), and is discussed in the next section.

Alternative 4 - - Integrated Pest Management (Preferred Alternative)

The environmental consequences of the integrated pest management alternative include a combination of the effects discussed above in Alternatives (1-3), differing in the extent to which each method is applied. Mechanical treatment by hand grubbing of selected areas would minimize the risk of exposing rare plant habitat to herbicide, and reduce herbicide treatment in campgrounds to only dense weeds that are impractical to mechanically hand grub.

The impacts of herbicide treatment on wildlife, fishery habitat and threatened and endangered species would be similar to the consequences described in Alternative (3).

To evaluate the human health hazard associated with the application of herbicides the Forest Service reviewed the hazards of commonly applied herbicides including picloram and 2,4-D at the National, Regional and Forest levels. An analysis specific to Alternative (4), assessed potential impacts of the herbicide treatment proposed on the Galllatin National Forest. A summary of some of the more important points of the site-specific analysis follows. Members of the general public are unlikely to be exposed to herbicide from most projects proposed on the Gallatin National Forest. Most herbicide application occurs on remote sites and at distances of over a mile from the nearest residence.

Visitation of these sites would be extremely rare. An exception would occur with the proposed application of a small amount of herbicide on 5 trailheads, 3 campgrounds and the visitor center at Earthquake Lake. In all cases, these areas would be closed during spraying and the spray area closed for 2 days after spraying.

With few exceptions, possible doses to the general public are below the acceptable daily intake (ADI) for 2,4-D and picloram. The ADI is defined as the dose of a pesticide that could be taken daily for a lifetime without adverse health impacts. Worker doses are likely to be much higher than general population doses. Although worker health can be adequately protected during picloram application by requiring use of protective clothing, 2,4-D exposure could exceed the ADI for projects requiring large daily applications. The possibility of minor effects on kidney function can not be conclusively ruled out based on the data currently available. However, because of the relatively "short" term, intermittent exposive of workers (three work weeks or less per year) long term effects on kidney functions are not expected. The importance of careful application techniques and use of protective clothing must be emphasized to workers.

The calculated risks of cancer from exposure to the pesticides applied in the proposed projects are below those associated with natural background exposure to carcinogens that humans encounter on a daily basis. This level of cancer risk is accepted by the Food and Drug Administration and the Environmental Protection Agency. The possible cummulative and synergistic impacts of Forest Service spraying, in addition to impacts from other spraying are not reasonably expected.

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A. PURPOSE AND NEED FOR ACTION

1. Introduction

Noxious weeds are rapidly spreading throughout the State of Montana on both private and publicly owned lands. Noxious weeds are having major impacts on agricultural lands, rangelands, and wildlands. Noxious weed control programs have been implemented on the Gallatin National Forest for many years. These control efforts typically have been closely coordinated with county weed control programs.

The term "noxious weed" is a legal designation and not a biological term. County and State laws designate certain plant species as "noxious" and require landowners to control them. A "weed" is a plant outside its desired location or plant where it is not wanted. All species considered noxious on the Gallatin National Forest are native to another location. Most of our noxious species came from Europe and Asia in the early part of this century, often imported as an impurity with crop seed and hay, or domestic livestock. Removed from their natural ecosystems, predators and competitors, these species rapidly spread in their new environment. The decrease of desirable native and domestic species that occurs with the increase in these undesirable, unpalatable (and sometimes poisonous) species is the essence of what is referred to as noxious weed problem.

Secretary of Agricultural Regulation 36 CFR 222.8 delegates to the Chief, Forest Service, authority to cooperate with Federal and State agencies in control of noxious farm weeds and use of pesticides. The objectives are to apply the Secretary's Regulation 36 CFR 222.8 relating to noxious farm weed as follows: (1) Control noxious farm weeds on Forest Service administered lands in cooperation with State and County weed control organizations. (2) Prevent invasion of National Forest Service range by noxious farm weeds through the establishment and maintenance of beneficial plant cover on all range areas. (3) In cooperation with Federal and State agencies, the Forest Service will monitor pesticide applications to insure effectiveness, placement accuracy, and minimal non-target effects. In addition to 36 CFR 222.8, Sections land 2 of the Carlson-Foley Act (82 stat. 1146, P.L. 90-583), October 17, 1968, and section 9 of the Federal Noxious Weed Control Act of 1974 (P.L. 93-629) gives direction to the Forest Service for control of noxious farm weeds.

In addition to the above Federal Regultions and Laws, Section 16-1706 of the Montana Weed Law makes it illegal "to permit any noxious weed, as named in the act, or designated by the board of county commissioners of the respective county to go to seed on any lands within the area of any district."

Noxious weeds recognized by the State of Montana are:

Canada Thistle	Circium arvense
Wild Morning Glory or Bindweed	Convovulus arvensis
Whitetop	Cardaria draba
Leafy Spurge	Euphorbia esula
Russian Knapweed	Centaurea repens

Many other weed species have been designated as noxious by County Weed Boards under the Montana State Weed Law. Target species for this program are:

Canada Thistle	
Leafy Spurge	
Russian Knapweed	
Spotted Knapweed	Centaurea maculosa
Oxeye Daisy	Chrysanthemum leucanthemum
Toadflax	Linaria Vulgaris
Musk Thistle	Cardus nutans
Houndstongue	Cynoglossium spp.
Tansy Ragwort	Tancetum vulgare

2. Background

Over 2,500 acres of the Gallatin National Forest have "dense stands" of "noxious weeds" as so classified by Federal, State or County weed laws. The acreage by species is listed below:

Name of Weed	Occasional Plant Acres	Widely Scattered Plant Acres	Dense Stand Plant Acres
Canada Thistle	15,000	3,500	750
Cluster Tarweed	300	200	100
Cocklebur	2,500	1,000	300
Curlycup Gumweed	7,500	2,500	200
Dalmation Toadflax	700	400	100
Houndstongue	75,000	25,000	350
Knapweed spp.	600	250	100
Leafy Spurge	1,800	450	200
Musk Thistle	3,000	1,500	500
Oxeye Daisy	1,000	500	100
Whitetop	500	300	100
Wyethia	- - -	100	-
TOTAL	107,900*	35,700*	2,800*

The above listed noxious weeds effect the National Forest land resources in several different ways. When forage production is reduced both domestic livestock and big game populations are affected. Along with forage production loss there is a loss in quantity and/or quality of habitat for small game, birds, and fisheries. Visual quality of recreation areas is lost. Tree survival rates among saplings is reduced and growth affected.

*(Howarth, 1983)

3. Control Efforts to Date

Control efforts have been hampered by low funding. The forest has stretched limited appropriated funds by utilizing the range betterment funding cooperating with County weed district efforts.

The funds expended and acres of noxious weeds treated 1983-1986 are summarized below:

	Acres	$ Spent
1983	35	1,715.00
1984	175	10,282.00
1985	424	18,135.00
1986	344	11,885.00

The Forest is cooperating with County Weed Boards in controlling noxious farm weeds to ensure a coordinated approach to this widespread problem. In Galltatin, Park, and Sweetgrass counties, the County Weed Control Crews are treating weeds on the National Forest in a cooperative effort with the Forest Service.

Biological weed control agents are being utilized, as they become available, in an integrated pest management effort. Insects that attack and feed on the seed of musk thistle and spotted knapweed plus leafy spurge have been released on the Forest in cooperation with the Rangeland Insect Laboratory (U.S.D.A.-A.R.S.).

4. The Issues

The scoping phase of the environmental analysis process revealed two main issues in the noxious weed problem:

a. Loss of Agricultural Production

The concern over the threat to agricultural production from the introduction and spread of noxious weeds on the Forest is a major issue. The local agricultural community and various local State and Federal agencies have expressed this concern.

b. Public Health and Safety

Public health and safety in the use of pesticides to control noxious weeds is another issue. Much of this concern has been expressed at the regional and national level. For example, this concern is expressed in recent court decisions in Oregon involving the BLM and the Forest Service (Ecosystems vs. Clark and Merrell vs. Block).

c. Other Issues and Management Concern

The effects of noxious weeds and/or herbicide on native vegetation and wildlife habitat, particularly threatened grizzly bear and Peregrine falcon habitat, where other concerns considered during the evaluation.

B. ALTERNATIVES CONSIDERED

To fully consider the issues and concerns that were identified during the scoping process a range of alternatives were developed by the interdisciplinary team. Some alternative components are available with more than one alternative. Preventative weed control measures would be implemented under all alternatives. These include aggressive revegetation of newly districted areas, improved range condition through range management, and public education.

Because of budget limitations the forest noxious weed strategy has been directed to the containment of new infestations as opposed to erradication. Erratication efforts are directed to new and small infestation. In addition, high priority is given to investigation and locations from which rapid migration to uninfested areas could occur.

The site specific projects are identified in appendix 7, A through E.

The alternatives include (1) no action, (2) cultural and biological control, (3) chemical and biological control, (4) integrated pest management. A description of each alternative follows. The proposed treatment and cost of the alternatives are compared in Table I following the narrative discussion.

1. Alternative 1 - - No Action

Under this alternative no attempt will be made to control or contain the spread of noxious weeds from coming onto or leaving National Forest System lands. Noxious weed species will be allowed to continue unchecked in their invasion of native vegetation. There would be no cooperation with the counties and adjacent private landowners in their on-going weed control efforts.

2. Alternative 2 - - Cultural and Biological Control

Mechanical methods (tillage, mowing and hand grubbing) would be the primary tools used to control noxious weeds under this alternative. Properly timed, these methods prevent plants from producing seeds and repeated efforts can deplete the root food supply of some perennials. These methods are usually limited by terrain, access and cost. The specific treatment and costs are shown by project on Table I - Proposed Mechanical Treatment of Noxious Weeds - Alternative (2).

Other cultural weed control applied under this alternative would include the prompt revegetation of soil disturbed by road construction, and the application of improved grazing practices as allotment management plans are implemented.

Biological control involves using natural insect and disease enemies that will attack individual noxious plant species to retard growth or prevent seed formation. At the present time, the only proven effective biological control agent in Montana is a seed-head weevil that attactks musk thistle (Rhinocyclus conicus). Two seed-head gall flies (Urophora affinis and U. quadrifasciata) have been released on spotted knapweed. In British Columbia, where both fly species are

established, spotted knapweed seed reductions of 95% have been reported. However, since seed production in dense stands can be from 7,000 to 90,000 per square meter, there would remain 350 to 2,000 seeds per square meter to maintain or spread the knapweed. There are other bio-agents that are in various stages of development in Montana including a leafy spurge defoliating moth (Hyles euphorbiae), a Canada thistle stem mining weevil (Eutorhynchus letura), and a spotted knapweed seed-head moth (Metzneria paucipunctella) (Montana State University. Dec. 1984).

Both the musk thistle seed-head weevil and the leafy spurge defoliating moth have been released on the Forest previously. This alternative would provide for continued monitoring of these bio-agents. New release of the leafy spurge defoliating moth would be made as the agent becomes available.

The area to be treated (275 acres - net) are specified by project in Appendix 3, Proposed Mechanical Treatment Alternative (2).

3. Alternative 3 - - Chemical and Biological Control

Noxious weed control would be accomplished primarily by the ground application of the herbicides picloram, and 2,4-D in Alternative (3). The area to be treated (275 acres - net) and the quantity of herbicide to be applied (382.7 pounds of 2,4-d and 167.1825 pounds of Picloram) are specified by project in Appendix 4, Proposed Ground Application of Herbicides - Alternative (3).

Ground application of herbicides will be accomplished mostly by spot application from hand held nozzles, either from vehicle mounted sprayers or backpack tanks. Weeds remote from road access and/or water will be treated with solid herbicide in the form of picloram (Tordon 2K) beads.

The herbicides would be applied in coordination with the control efforts of the County Weed Boards and adjacent private landowners. In many cases the herbicides would be applied by the County Weed District Crew.

Biological control under Alternative (3) would be the same as under Alternative (2) above. Leafy spurge defoliating moths and musk thistle seed-head weevils would continue to be monitored, and new releases made as available. This would include, but not limited to, the leafy spurge defoliating moth.

4. Alternative 4 - - Integrated Pest Management (Preferred Alternative)

Alternative (4) would involve an integrated pest management approach to noxious weed control in coordination with the landowners adjacent to National Forest System lands. The integrated pest management approach is a comprehensive systems approach to achieving economical pest control in an environmentally acceptable manner. The individual components of integrated pest management include: cultural (mechanical, manual, prescribed fire) biological, chemical, and regulatory means. Each of the components may be used alone or enhanced by combining and timing with other methods to produce a more effective pest management strategy. Alternative (4) provides for the application of integrated pest management principles, but emphasizes chemical control as the primary method.

Cultural weed control under Alternative (4) would include: (1) the grubbing of weed infestations in wilderness areas, near special interest plant habitat, and in selected portions of campgrounds (2) prompt revegetation of soil disturbed by road construction or other

means, (3) the application of improved grazing practices as range allotment management plans are implemented.

Biological control under Altrnative (4) would be the same as under Alternative (2) and (3) above. Spotted knapweed seed-head flies and musk thistle seed-head weevils would continue to be monitored, and new releases made as needed. The leafy spurge defoliation moth or other bio-agents may also be released if available for an appropriate site on the Forest.

Chemical control under Alternative (4) would be applied on 260 acres in 1987-1990. the herbicides 2,4-D and picloram would be spot applied to individual weeds by hand-held nozzle from either backpack or truck mounted tanks. Some weeds too remote from road access or water would be treated with solid herbicide in the form of picloram beads. Details of the herbicide amount, cost, and sites to be treated are displayed in Appendix 7, A through E.

Education would be a feature of integrated weed management under this alternative also. An active public information program would be implemented to inform the public about the effects of noxious weeds. Wilderness and backcountry visitors and outfitters would be advised of the possible introduction of weed seed in hay, and encouraged to bring only clean hay from known weed-free sources (cake or pellets) on pack trips. Forest Service personnel would also be informed and trained to identify noxious weeds and to make weed control a Forest objective of concern to all employees.

TABLE I

Comparison of Alternatives by Treatment and Cost

Treatment 1/	Alternative 2 Cultural & Biological Control	Alternative 3 Chemical & Biological Control	Alternative 4 Integrated & Biological Control
Mechanical treatment			
1987 Acres	275	0	15 ac.
Cost	$42,350	0	$2,310
5 year total			
Acres*	1,375	0	75 ac.
Cost	$211,750	0	$11,550
Herbicide treatment	0		
1987 Acres	0	275 ac.	260 ac.
Herbicide lbs.	0	550 lb.	526 lb.
Cost	0	$18,293	$17,164
5 year total			
Acres*		1375 ac.	1,641 ac.
Herbicide lbs.		2750 lb.	2,630 lb.
Cost		$91,465	$ 85,820
Total - 1987 Ac.	275	275	275 ac.
1987 Cost	42,963	$18,293	$19,474
5 year total ac.	1,375	1,375	2,796 ac.
5 year total cost	$211,750	$91,465	$97,370

* including re-treated acres

1/ Alternative (1) would have no active treatment program, (biological, mechanical, or chemical) and no direct treatment cost, therefore, Alternative (1) is not shown in the table. The environmental costs and benefits of all alternatives are displayed in table II in section D Environmental Consequences.

2/ Alternative (2) assumes annual monitoring of existing populations of bio-agents and new releases as needed and available, and assumes hand grubbing and mowing of all infested acres annually during the planning period, with little or no reduction in area infested by weeds, because of regrowth and seed germination.

3/ Alternative (3) assumes a reduction in weed infested areas each year as treatment effectively reduces the populations of weeds, especially spotted knapweed, whitetop, and thistles. Total acres to be treated will remain the same in order to include presently invested areas on the forest.

4/ Alternative (4) includes less acres of chemical treatment than Alternative (3) because of mechanical treatment on some areas and the weed management strategy for some populations of containment, rather than control. Biological control would be applied to the major portion of containment projects with chemical on portions of the projects. As in Alternative (3), it is assumed that there is a gradual reduction in weed infested area from year to year. Total acres to be treated will remain the same in order to include presently invested areas on the forest.

5/ Biological control monitoring is included in overall maintenace of all alternative.

6/ During the 1986 season, the only treatment applied with herbicides, will be done following approval of the EIS.

Alternative Comparison - Table __ on the following page compares the effects of implementing each of the alternatives. This table is a summary of the major effects discussed in the environmental consequences section and elsewhere in the document.

TABLE II
EVALUATION OF ALTERNATIVES

Evaluation Factors	Alternative 1 No Action	Alternative 2 Cultured and Biological Control	Alternative 3 Chemical and Biological Control	Alternative 4 Integrated Pest Mgt
	4*	3*	1*	2*
Noxious Weed Infestation	Increase to almost double in 5 years	Arrest or slow the advance	Reduce area infested rapidly	Reduce Area infested at mod. rate
	4	3	1	2
Forage production	Continue to decline on infested acres	Increase by about 30 AUM	Increase by 72 AUM	Increase by 72 AUM
Public Health and Safety:	1 no hazard	2 Worker Hazard only	4 High margin of public safety	3 high margin of public safety
	4	1	3	2
Impact on Native Vegetation	Severe on *** acres infested. Increasing to **** ac in 5 yrs	Favors varied early succession species on 275 ac.	Favors grasses reducing most broadleafe on 275 ac.	Favors grasses reduces broadleaf on 260 ac
Soil Erosion	3 Gradually increasing amount and size of area	4 Immediate increase on area treated	1 Reduction in soil erosion	2 Reduction in soil erosion
	4	1	3	2
Impact on Wildlife Habitat	Small impact now, but double in 5 years	More favorable than 1 and 3	Small impact on acres treated	Small impacts on acres treated
Impact on T & E Animals	4 Same as above	1 Same as above	2 Same as above	2 Same as above
Impact on Rare Plants	3 Could effect some	1 Could effect some	4 Could effect some	2 Could effect some
Cost to implement project short term	1	4	2	3
Long term cost to resource values	4	3	2	1

*1, 2, 3, 4 are relative subjective ranking of the alternatives from most favorable (1), to least favorable (4).

C. AFFECTED ENVIRONMENT

1. Description of the Principal Noxious Weeds

a. Leafy spurge is a very troublesome noxious plant in Montana. It is a competitive, aggressive perennial which is difficult and expensive to control. It has deep, tenacious root systems, the capacity to sprout from root segments, and has underground buds and seeds which can remain viable for many years. Leafy spurge contains a toxin that can cause toxic effects in animals from either internal or external exposure. There is direct evidence that leafy spurge has allelopathic properties, i.e., the weed releases chemicals that inhibit the growth of other plants in the same area. It grows any place from the best agricultural land to rocky slopes and hillsides of low productive rangeland sites. Infestations range from solid stands where all other vegetation is virtually eliminated to isolated patches which serve as a seed source for infestation of additional areas.

b. Spotted knapweed is a biennial or short-lived perennial plant which reproduces only by seed, yet is able to invade a wide variety of habitats. Flowers are usually purple and the outer row of bracts under the head have black, fringed tips. It produces seed even with below normal precipitation, and then rapidly invades areas where other vegetation is weakened by drought. The late fall and early spring growth pattern gives it a competetive advantage over many native plants. In addition, this weed produces an allelopathic toxin (cnicin) that inhibits the germination and root growth of native grasses and trees. This compound may be deposited by knapweed into the soil, reducing the competition from associated vegetation, suppressing normal plant succession, and allowing the development and perpetuation of a weed monoculture of almost pure spotted knapweed. Spotted knapweed is considered a threat to much of Montana's rangeland and wildlife habitats. It spreads even more rapidly thatn leafy spurge.

c. Whitetop is a perennial mustard reproducing by seeds and horizontal creeping roots. It is found along roadsides, waste places and on rangeland. The stems are erect or spreading; stout, slender, or branched stems, slightly to very hairy and 4 to 24 inches tall. The flowers are white, little more than 1/8 inch wide, each on a stalk about 1/2 inch long. Whitetop is also referred to as hoary cress.

d. Musk thistle os a biennial reproducing by seed. It is found in roadsides, fencelines, pastures, haylands and meadows. The stems are erect, branched above, hairy, spiny leaves give the stem a winged appearance; 3 to 5 feet tall. The plant has a heavy taproot. The flowers are deep rose to purple in color.

e. Canada thistle is an introduced, deeprooted, perennial forb. This spiny plant reporduces by seeds and creeping rootstocks that spread laterally 12 to 15 feet in a single year. The shoots form on these roots each spring. Its grooved stems are 2 to 5 feet tall, and branch near the top. They are slightly hairy when young, but become covered with hair as the plant matures. Most of the leaves are oblong, irregular and have deeply cut, spiny-toothed edges. Flowers are 3/4 inch or less in diameter and are usually purple to rose in color.

f. Dalmation toadflax (Linaria dalmatica) and Yellow toadflax (Linaria vulgaris) are introduced wild snapdragons that produce attractive yellow and orange flowers. They spread readily by a woody, creeping horizontal root system which enables the plants to survive and compete with native vegetation on dry, harsh sites. The plants are very unpalatable to livestock, and difficult to control.

The characteristics of the two weeds of greatest concern on the Gallatin, spotted knapweed and leafy spurge, are illustrated on the plates that follow.

2. Location

The proposed project area are located in Gallatin, Madison, Park, Meagher, and Sweetgrass counties in Montana. All areas are publicly owned National Forest System land and road right-of-ways managed by the Gallatin National Forest. Maps and site specific information for each site can be found in the Supervisor office, Gallatin National Forest. Site specific locations are listed in Appendix 7 A through E.

Project Site General Descriptions

Categories of project environments that encompass all areas proposed for treatment are:

a. Forest Roads and Trails - Noxious weeds in this environment are confined primarily to areas where soil disturbance has provided an adequate seed bed. Cut and fill slopes are the primary areas of concern.

b. Recreation Sites - Areas included in this listing are campgrounds, trailheads (end of road facilities included), interpretive sites, and visitor information centers.

c. Timber Harvest Areas - Includes temporary roads, skidroads, firelines and landings. Soil disturbance inherent found with this type of activity provides the proper environment for establishment of noxious weeds.

d. Administrative Sites - Ranger stations, guard stations, and horse pastures are included under this project environment.

e. Mountain Rangeland - Primarily grassland vegetative types often intermixed with patches of timber including aspen, juniper, lodgepole pine, and Douglas fir. Domestic livestock production is generally associated with this project environment.

LEAFY SPURGE (Euphorbia esula L.): A. Habit (X0.5); B. flower cluster (X2.5); C. capsule (X2.5); D. seeds (X6)

SPOTTED KNAPWEED (Centaurea maculosa Lam.): A. Habit (X0.5); B. leaf (X1); C. flower head (X2); D. disk flower (X3.5); E. achenes (X4)

3. Climate and Air Quality

The climate for the Gallatin National Forest is typical of the Rockies east of the Continental Divide. It is characterized by warm summers with most of the precipitation falling as rain from April through the end of June, or in the high elevators as winter snows. Average annual precipitation ranges from 30 to 40 inches in the mountainous areas to 15 to 20 inches in the foothills of the forest.

Air quality in the EIS area is good overall. Most of the EIS area is Class II, which allows moderate deterioration of air quality. The Clean Air Act Ammendments of 1977 contain provisions to ensure that air quality does not deterioraze in areas with clean air.

4. Geology and Topography

Much of the Forest's present geology is accounted for by episodes of mountain building, which occured about 60 million years ago. All but one of the Gallatin's mountain ranges were created by the over thrusting of rock strata. One range - - the Crazy Mountains - - was formed by a massive domal uplift.

The topography consists of rolling foothills and level benches moving up to steeper slopes and ridges.

5. Soils

Broad areas of clayey soils exist in the Absaroka mountains, Bridger - Bangtail mountains, Upper Gallatin Canyon, and parts of the Gallatin and Madison ranges. Other soils on the Forest are relatively coarse-textured, such as those found in the Beartooth mountains, Crazy mountains, the West Yellowstone sands area, and the Spanish Peaks.

A more detailed explanation of the soil types found at each control site can be found in the interim draft report, soil survey of Gallatin Forest Area Southwestern Montana, April 1984.

6. Water Resources

The Gallatin National Forest provides approximately 2,028,000 acre-feet of water to the Missouri River drainage during an average year. The quality of water being produced on the Forest of present is very high, as evidenced by the headwaters of three major Blue Ribbon trout streams on the Gallatin National Forest - - the Madison, Gallatin, and Yellowstone rivers.

In these areas, most streamflow results from spring snow melt, and local surges result from summer thunderstorms.

7. Vegetation

The Gallatin national Forest supports forests on upperslopes, alpine tundra above timberline, conifer forests, aspen, grasses, mountain shrub and sagebrush - grass vegetation. Major tree species include lodgepole pine, Douglas fir, ponderosa pine, subalpine fir, whitebark pine. Limber pine, willow, aspen and alder are also common. The areas predominant shrubs are common snowberry, big sagebrush, curleaf mountain mahogany, serviceberry, chokecherry, and ninebark. Major grass species include bluebunch wheatgrass, Idaho fescue, Kentucky bluegrass, alpine grasses, pinegrass, mountain biome, timothy, and needlegrasses. There are no known threaten or endangered species located on the forest.

8. Animals

Livestock

Currently on the Gallatin National Forest there are 39,150 animal unit months (AUM's) being grazed per year. This amount is being taken primarily by cattle, then sheep and horses. (GNF Draft Forest Plan 1985)

Wildlife

The EIS area encompasses a variety of wildlife habitats. Wildlife diversity and abundance is high on the Gallatin National Forest.

Biggame species found within the EIS area include: elk, bighorn sheep, muledeer, whitetailed deer, moose, black bear, grizzly bear, mountain lion.

Upland game bird species found within the EIS area include blue, Franklin, ruffed, and sharptail grouse. Hungarian partridge are also found within the area.

Waterfowl are found in isolated instances within the control areas but in very small numbers during the periods of noxious weed control.

Fish

Many game fish species inhabit the EIS area, including cutthroat trout, rainbow trout, browntrout, brooktrout, grayling, and whitefish.

Trout spawn in both the major rivers and tributary streams. Rainbow and cutthroat trout spawn in the spring. Brooktrout and browntrout spawn in the fall.

Threatened and Endangered Animals

The EIS area provides habitat occupied by two endangered species - - bald eagle, peregrine falcon, and one threatened species - - grizzly bear.

9. Cultural Resources

The historic and prehistoric sites that exist on the Forest are protected by the National Historic Preservation Act and other mandates. Surveys conducted have uncovered several hundred sites, 53 of which are eligible for inclusion on the National Registry of Historic Places.

There is no forseeable conflict between noxious weed control and the cultural resources on the Forest at this time.

Visual Resources and Recreation

The Gallatin National Forest ranks high in visual resources and recreational values. noxious weed control is being alone on road right-of ways throughout the EIS area and at approximately 10 recreational sites, these being end of road facilities, trailheads, and campgrounds.

10. Wilderness and Special Areas

There will be no chemical control of noxious weeds within the Absaroka-Beartooth or Lee Metcalf Wilderness on the Gallatin National Forest unless approved by the Regional Forester.

Economic Conditions and Social Environment

Contract spraying has provided income to individuals who have had successful bids for weed spraying on the Gallatin National Forest. County weed control programs are also supplemented with Forest Service funds for their work on National Forest right-of-ways in certain locations.

If the noxious weed control program were curtailed economic losses would be in the form of (1) Loss of grazzing capacity on rangelands infested with noxious weeds on the National Forest. (2) Loss of recreational use at trailheads and campgrounds infested and overrun with noxious weeds and (3) loss of wildlife habitat.

As weeds spread onto private rangeland economic losses would be proportionate to investation levels.

A significant social issue related to the Gallatin National Forest's weed control program is possible public disagreement about the use of herbicides and the effectiveness of alternative treatments.

Opponents of herbicides may see the Forest Service as having a bias in favor of herbicides. They could see the Forest Service as not taking serious concern and research into what they perceive as more legitimate control measures. The proponents of herbicide use could see the Forest Service looking for unnecessary alternatives to what they believe to be a demonstrably safe and effective means for controlling noxious weeds.

Some people are concerned with; (1) the spread of noxious weeds from National Forest lands onto private or state lands; (2) the economic losses from this encroachment; and (3) the effects of noxious weeds on native vegetation. Public interest also exists in cooperative programs of weed control. Concern over the spread of noxious weeds is expressed by county and state laws enacted to control noxious weeds.

Another segment of the public is concerned with not having control over their larger environment, including the management of National Forest lands. There is a growing sense that the nonprofessional public has a legitimate interest in how these land resources are managed. The traditional attitude of leaving resource management to the "professionals" is becoming less prevalent, with more people wanting some say in how professionals do their job.

D. ENVIRONMENTAL CONSEQUENCES OF ALTERNATIVES

1. No Action

Left unchecked the noxious weeds will continue to spread on the Forest. It appears that knapweed has been spreading in Montana at an average annual rate of about 27% since 1920 (Montana State University, Oct. 1983). At this rate the Forest acres infested by spotted knapweed will increase from 200 dense acres in 1985 to 659 acres in 1990. Spread of leafy spurge is estimated to be about 12% per year (Lewistown District, BLM, 1985). At this rate, the area infested on the Forest will increase from 251 dense stand acres in 1985 to 440 acres in 1990. Whitetop and thistle with a combined infestation of 850 acres is estimated to spread at about 4% per year, which should result in about 1,033 acres infested by 1990. Therefore, the total weed infested acres of these species is likely to increase from 1,301 in 1985 to a level of 2,132 acres in 1990; almost double the current level. Left unchecked, the cost of weed control could double in 5 years.

There are 300 acres of open range with heavy knapweed and leafy spurge infestations that will not be treated under this alternative. Assuming an average potential carrying capacity of 2.5 acres/AUM (0.4 AUM/ac.) when the weeds cause a 60% loss of forage there are 0.24 AUM's of forage lost per acre or 72 AUM's on this range that will not be recovered (Montana State University, April, 1983). Forage production would decline on the newly infested range areas at a rate of about 10% per year starting in the second year of infestation. By the end of the 10th year following invasion, the knapweed density would approach 90% with little forage available for livestock (Montana State University, December 1984).

The allelopathic toxins in leafy spurge and spotted knapweed often result in the development and perpetuation of a weed monoculture. The most drastic biological effect that this could have would be the elimination of rare plant species (Montana State University, December 1984). At present there are no known plant species in or adjacent to the project area classified under the Endangered Species Act. However, there are plants of special interest present that are listed on the

"Preliminary List of Vascular Plants of Rare and Undetermined Status for the State of Montana." (Lesica, Peter, et. al. June 1982). Appendix 10, file letter from Steve Shelly, Botianist, Montana Natural Hertiage Program. Some of these plants could eventually be eliminated from the area by the severe biological competition of knapweed and/or leafy spurge, although there is no immediate threat.

As knapweed and leafy spurge increase and crowd out more favorable forage plants the habitat for may wildlife species would likely deteriorate. The project area includes the occupied habitat of the threatened grizzly bear, and important seasonal ranges of elk, deer, bighorn sheep, black bear, mountain grouse, and many other wildlife species. There is some evidence that deer and elk may feed on young, green knapweed plants. However, not controlling these noxious weeds could result in a long-term decline in the habitat of the grizzly bear and many other wildlife species, especially big game winter range. However, the present impact is not significant because of the scattered nature of the infestations.

Impacts to fisheries would be in the form of potential increases of sedimentation and decreases of bank stability associated with the noxious weeds crowding out more desirable vegetation. These impacts stem from the decrease in streamside vegetation that function as a filter for sediments coming from overland flow. The extensive root systems developed by grasses, sedges and shrubs along streambanks is a very important factor in streambank stability.

There would be no human health risk associated with the No Action alternative.

2. Alternative (2) Cultural and Biological Control

Results from a study of cultural practices for leafy spurge in 1983 showed that hand pulling could be an effective way to control small infestations of leafy spurge for one year. Seed production can be eliminated and regrowth is severely stunted, which will slow the advancing infestation. This method of control would be best suited to small patches along waterways where herbicide use is restricted and where leafy spurge seed production must be eliminated to prevent dispersal by water (Montana State University, Aug. 1984). However, because the roots of leafy spurge may produce vegetative buds as deep as five feet below the surface, it is impractical to fully dig the plants up to prevent resprouting. Eradication of leafy spurge with mechanical methods requires 2 to 3 seasons of intensive cultivation with a duckfoot cultivator 4 inches deep every 21 days during the growing season (Sonder, Leslie, 1969).

The initial cost of mechanical treatment $42,000 in Alternative (2) is 238% more than for chemical treatment in Alternative (3) $18,000. In addition, the cost of needed follow-up mechanical treatment in subsequent years $43,000 would be two or three times the needed follow-up chemical treatment ($18-$19,000).

Soil disturbance and erosion would increase more under mechanical weed control than under Alternatives (1), (3), and (4). Alternative (2) would have less impact on plant species composition, as fewer non-target plants would be affected. Mechancial treatment would present the least risk to special interest plants in the area. Wildlife habitat would benefit more from mechanical treatment than no control or chemical control.

The human health risk associated with the mechanical treatment alternative would be the safety hazard for workers using small hand tools in grubbing out weeds, and for operating , mowing, and tillage equipment. There would be little or no hazard to the general population.

Mechanical treatment of weeds would improve the forage resources for livestock in the long run. However, where soil disturbance is great, the resulting initial increase in plants would be largely "pioneer" weedy broadleaf species replacing the noxious weeds. Follow-up efforts would require artificial seeding of desirable forage plants on highly disturbed sites, such as tilled land. There would be a high risk of the reinvasion of noxious weeds or other undesirable plants on the disturbed soil. Overall the forage improvement under this alternative would be intermediate to Alternatives (1), (3), and (4).

3. Alternative (3) Chemical and Biological Control

Research shows that the application of herbicide can provide effective control of the target weeds. Residues of the herbicide picloram remain in the soil for up to three years and will kill seedlings for two or more years after application, depending on soil texture. Experimental results of 99-100% control of both knapweed and leafy spurge the first year of treatment have been demonstrated. However, it is necessary to follow-up with re-treatment for several subsequent years because of persistent seed germination and deep dormant buds that survive the herbicide treatment and residual effect. 2,4-D can be effective in controlling leafy spurge and knapweed where picloram is restricted, but annual applications of 2,4-D would be required indefinitely to control leafy spurge (Messersmith, C.G., 1983 and Montana State University, Dec. 1984).

The cost of chemical treatment is high ($18,000) but is about 40% of the cost of mechanical treatment ($42,000).

The herbicides, picloram, and 2,4-D, are selective in their action. Most broadleaf herbacious plants, wood shrubs, vines, and trees are susceptible to toxic response to these chemicals. However, most grasses are resistant and show little effect (Dow Chemical Company, 1983). As a result of this selective action, herbicide treatment releases grasses from the competition with herbacious plants and results in a rapid increase in grass density and production. Following herbicide treatment on the project area, forage production would be rapidly improved on 300 acres of rangeland. It is estimated that forage production would increase by 72 AUM.

Sites to be treated on the Forest with herbicides are classified into four types:

1. Rights-of-way - Treatment occurs near a road right-of-way. Often soils along rights-or way are recently distrubed. Treatment of weeds will provide existing grass species opportunity to spread and thrive. Herbicide application involves spot applications within 10-30 feet of the road. 70 percent of the sites to be treated are rights-of-way type.

2. Riparian - This indicates treatment occurs near a stream, lake, wetland, meadow, etc. Mitigation measures in section E of this chapter are prescribed to prevent herbicide application to any standing or running water.

3. Open Range - This indicates that treatment occurs on general open range or forest lands. The largest open range site on the Gallatin Forest scheduled for treatment contains about 40 acres of noxious weed infestation scattered over an area of 2600 acres. Most treatment sites are an acre or less in size.

4. Occupied Site - This indicates that treatment occurs on a human occupied site such as a campground or ranger station. Mitigation measures for herbicide application are listed in section E of this Chapter. Appendix 8A provides and assessment of the human health risks for all project typers. Appendix 7 lists each site by type, weed species and acres to be treated.

Where herbacious plants and shrubs are important wildlife habitat components, herbicide treatment of intermingled noxious weeds could cause a deterioration in habitat conditions by reducing plant diversity. However, where a large monoculture of noxious weeds exists the herbicide treatment would improve plant diversity. Since most of the present weed infestations are small, isolated patches, or intermingled with other vegetation the chemical treatment is expected to cause only a short-term decline in wildlife habitat cover and forage.

The herbicides that are proposed for use in chemical control (2,4-D and picloram) both have a low level of toxicity to birds and mammals. Because of this low toxicity, and the procedure of spot application, the risk of any adverse effects on wildlife species is very low.

Threatened grizzly bear occupied habitat is involved on 65 net acres that would be treated with herbicides. However, because the treatment is largely roadside right-of-way and trailheads, the area affected is of low habitat effectiveness for the grizzly bear. Therefore, no adverse effects would be expected on the grizzly bear or its habitat based on the biological evaluation Appendix 2A.

The proposed chemicals are toxic to fish, however, toxicity is directly related to the concentration levels that enter the water. Herbicides that enter into a small stream of less than 5 cubic feet per second (cfs) of water will have a greater impact than they will in a larger stream with 20-30 cfs. Concentrations of herbicide in water, even under reasonable foreseeable case conditions, would be below 0.1 milligram/liter, which is 0.1 ppm (See section 2.4.6.4 of appendix 8B). Research on the toxicity of 2,4-D and picloram, show that the LC_{50} for rainbow trout is 100 parts per million (ppm) and 50-58 ppm respectively. LC_{50} is the concentration of pesticide in the water necessary to kill 50% of the fish population. The proposed projects that are near streams should have little potential effect on the fisheries because of the high volumes of water and low rates of application being applied (Walch 1985 and Hancock 1985).

Although there are no known plant species in or adjacent to the project area classified under the Endangered Species Act of 1973, there are rare plants of limited distribution present which are subject to elimination by herbicide treatment over relatively small areas of habitat (Lesica 1982). Some of these special interest plants could be eliminated by herbicide drift or movement of picloram in the soil. Picloram is long lasting, potentially mobile in the soil, and is highly toxic to both weeds and desirable broadleaf plants alike. There is a high risk of killing some special interest plants, under this alternative, since herbicide would be applied adjacent to rare plant habitat.

The human health hazard associated with the application of herbicides is a major issue. The human health hazard for Alternative 3 is similar to Alternative 4. For a description of the human health risks associated with herbicide treatment refer to Appendices 8A and 8B and

the narrative discussion of environmental consequences for Alternative 4 below. Since the herbicide being applied is greater in Alternative 3 than in Alternative 4, the human health risk is also considered greater, although the reasonable foreseeable case scenario is essentially the same in both alternatives.

4. Alternative (4)Integrated Pest Management (Preferred Alternative)

The environmental consequences of the integrated pest management alternative include a combination of the effects discussed above in Alternatives 1-3, differing only in the degree to which each method is applied.

All weed treatment in the wilderness would be by hand grubbing. Soil disturbance and erosion resulting would be negligible for this treatment. Mechanical treatment by hand grubbing of these selected areas would minimize the risk of exposing rare plant habitat to herbicide, and reduce herbicide treatment in campgrounds to only dense weeds that are impractical to mechanically hand grub. The proposed mechanical treatment could potentially disturb unidentified cultural resources (historical or prehistorical) on or near the ground surface. Because of the scattered, low density of weeds on the acres scheduled for mechanical treatment, the probability of affecting cultural resources is low. Cultural control would be applied to a small 15 acres in 1987) area of scattered weed infestations.

The cost of control in Alternative 4 is lower than full cultural treatment in Alternatives 2 and 3 (see Table I - Comparison of Alternatives).

Sites to be treated with herbicides are classified into four types as described in Alternative 3 and listed in Appendix 7.

The impacts of herbicide treatment on wildlife, fishery habitat and threatened and endangered species would be similar to the consequences described in Alternative 3, but with a somewhat lower impact because the amount of herbicide proposed is less in Alternative 4.

The human health hazard associated with the application of herbicides is a major issue with certain segments of the public. To investigate this risk, the Forest Service reviewed the hazards of applying commonly applied herbicides including picloram and 2,4-D. The results of this assessment were published in August 1984 in Pesticide Background Statements, Volume I, Herbicides, Agriculture Handbook No. 633 (USDA Forest Service. 1984). These background statements provide a comprehensive review of the available information concerning the use, chemistry, toxicology, environmental fate, and comparative hazard of the herbicides in forest applications. The toxicology data in this background statement is presented for invertebrates, fish, birds, and mammals. Mammalian toxicology data is further divided into acute, subchronic, chronic, reproductive toxicity, mutagenicity, and carcinogenicity (see Appendix 1b Glossary).

More specific worst-case risk analysis for projects in the Northern Region was completed in 1985 and revised in 1986. This assessment is contained in the document titled Analysis of Human Health Risk of the USDA Forest Service Use of Herbicides to Control Noxious Weeds in the Northern Region . This document is included as Appendix 8B of the Environmental Impact Statement. This document analyzes the risk to human health resulting from the application of various herbicides (including picloram and 2,4-D) on noxious weed project models similar to the proposed projects on the Gallatin National Forest.

Finally, an analysis specific to the proposed Alternative 4, application of herbicide on the Gallatin National Forest, was conducted. This analysis is contained in Appendix 8A titled Human Health Risk Analysis for Proposed Herbicide Spray Programs to Control Noxious Weeds on the Gallatin National Forest . The Gallatin National Forest analysis is based on the Regional analysis ard assesses potential impacts of the specific sites proposed for spraying on this Forest. The following paragraphs summarize the salient points of the site-specific analysis.

In reality, members of the general public are unlikely to be exposed to herbicide from most projects proposed on the Gallatin National Forest. Most herbicide application occurs on remote sites and at distances of over a mile from the nearest residence. Visitation of these sites would be extremely rare. An exception would occur with the proposed application of a small amount of herbicide (about 5 pounds active ingredient) to five trailheads, 3 campgrounds and the visitor center at Earth Quake Lake. In all cases, these facilities would be closed during spraying and the spray area closed for two days after spraying.

The doses to workers and members of the general public are calculated using various conservative assumptions that overestimate impacts. For example, open-range projects are assumed to be within 200 meters (one-eighth mile) of a residence when, in fact, residences are typically further than a mile from open-range projects and none are closer than one-quarter mile.

The calculated worst-case doses are compared to the pesticide Acceptable Daily Intake (ADI) as determined by the U.S. Environmental Protection Agency. The ADI is defined as the dose of a pesticide that could be taken daily for a lifetime without adverse health impacts. The ADI is determined by dividing the dose level shown to have no effect on test animals (the no-observed-effect level or NOEL) by a safety factor. A safety factor is used to allow for differences between test animals and humans, to account for test methods uses; and to allow for more sensitive humans. Safety factors of 100 or greater are typically used; thus for 2,4-D the ADI is equal to the NOEL divided by 100.

With only three exceptions, all possible doses to the general public are below the ADI's for 2,4-D and picloram. The dose could exceed slightly the 2,4-D ADI if a person ate one-half pound of wild food directly sprayed with 2,4-D. This dose must be considered a low-probability event considering the remote location of spray sites

and the fact that wild foods such as berries would not ripen for several weeks or more after spraying. Direct spraying of berry bushes would also probably "burn" the vegetation and prevent fruit development.

The worst-case dose could slightly exceed the ADI for 2,4-D if an individual (with bare legs, arms, hands, face, and neck) stays within a meter of spraying. Again, this scenario would be highly unusual.

In the event of a major spill of herbicide into a drinking water source, a person drinking a large amount of water (e.g., over 2 quarts for an adult) could receive a dose that slightly exceeds the ADI. However, a truck accident resulting in the spill of herbicide is a very unlikely event. A major spill into water is even more unlikely.

Worker doses are likely to be much higher than general population doses. All worker 2,4-D dose estimates are above the ADI for 2,4-D. Worker picloram dose estimates are above the picloram ADI if worker is assumed to wear little protective clothing and to apply pesticides with sloppy techniques.

Although worker health can be adequately protected during picloram application by requiring use of protective clothing (long sleeved shirts, gloves, hats), 2,4-D exposure could exceed the ADI for projects requiring large daily applications. The significance of this exceedance requires further consideration particularly since the ADI assumes a lifetime of doses and workers would be exposed for a maximum of 3 weeks.

Under normal protection scenarios, worker dose is estimated to be 11 to 33 times less than the NOEL based on animal tests. At 2,4-D dose levels above this NOEL, test animals (rats) began to exhibit changes in kidney function. These effects ceased when dosing ceased. Since humans can be 6 to 12 times more sensitive to chemicals than test animals (see Section 2.5 of the Northern Region Risk Analysis in Appendix 8B), some workers could experience short-term effects on kidney function although symptoms would not be obvious over the typical applicaiton period. Again, the importance of careful applicaiton techniques and use of protective clothing must be emphasized to workers.

Although the evidence on the cancer-causing potential of 2,4-D and picloram is ambiguous, both compounds are assumed to cause cancer. The estimated lifetime cancer probability for a member of the general public exposed to 2,4-D or picloram is less than one chance in ten million even assuming worst-case doses from five consecutive years of spraying. Worker cancer probabilities are on the order of one to five chances in a million.

The linear cancer model used in the analysis estimates the upper bound of the cancer risk and generally overestimates risk. Therefore, the cancer risk as estimated by the risk analysis has a built-in margin of safety for humans. The calculated risks are below those associated with natural background radiation that humans encounter on a daily

basis. This level of cancer risk is accepted by the Food and Drug Administration and the Environmental Protection Agency.

The possible cumulative and synergistic impacts of Forest Service spraying, in addition to impacts from other spraying, are discussed in Section 2.8 of the Northern Region Risk Analysis in Appendix 8B. Given the widely scattered nature of these herbicide treatments (261 acres treated on a 1.8 million acre National Forest), such effects are not reasonably expected.

E. MANAGEMENT CONSTRAINTS

This section lists the constraints that must be applied to approved projects.

1. All herbicide application workers must be advised explicitly of the hazards of these chemicals and instructed in the careful herbicide application techniques, so as to reduce dose levels below worst-case values assumed in the risk analysis.

2. Appropriate personal protective equipment will be included in developing project safety and health analysis (FS 6700-7) for Forest Service applicators (see Health and Safety Code Chap. 9-10 FSH 6709.11).

3. Pesticides must be applied under the supervison of a licensed pesticide applicator under the laws of the State of Montana. To apply picloram, the applicator must be licensed for restricted use herbicides. Pesticides must be applied consistent with the instructions on the label (see Appendix 9, A-C).

4. No herbicides will be applied within wilderness areas, proposed research natural areas, or areas occupied by rare plant species unless approved by the Regional Forester . Weed control in these areas will be by cultural methods only (hand grubbing, etc.). Sufficient buffer zones (at least 50 feet) will be established to prevent herbicide drift or subsurface movement into these areas.

5. The use of herbicide to control weeds in campgrounds will be restricted to 2,4-D only. Public notification and signing will precede the application of herbicide, and the treated areas will be closed to public use for two days following treatment. Areas adjacent to water wells, and other selected areas within the campgrounds will be mechanically treated by hand-grubbing.

6. No herbicide will be applied directly to any standing or running water. Picloram will not be sprayed within 50 feet of a stream, pond or other water source, or within the normal high water level of streams or ponds, whichever is the greater distance. Picloram will not be sprayed, or allowed to drift onto the inner banks of ditches or water channels that carry water.

7. The location of the inventoried noxious weed infestations scheduled for mechanical treatment will be compared with the Forest cultural resource site atlas in consultation with the

Forest Archeologist prior to treatment. If it is determined that there is a probability of cultural resource disturbance, then, on-site cultural inventory will be conducted prior to treatment. If cultural resources are noticed during mechanical treatment, the work will be stopped until the Forest Archeologist can conduct a cultural resource evaluation.

8. If herbicides are applied in municipal watersheds constraints in 6 above will be used.

F. LIST OF AGENCIES, ORGANIZATIONS, ELECTED OFFICIALS AND INDIVIDUALS TO WHOM COPIES ARE SENT

Elected Officials:

Max Baucus, U. S. Senator
Ron Marlenee, U.S. Congressman
Ted Schwinden, Governor of Montana
John Melcher, U.S. Senator
Pat Williams, U.S. Congressman

Federal Agencies:

Animal and Plant Health Inspection Service
Bureau of Indian Affairs
Bureau of Land Management
Environmental Protection Agency
Federal Highway Administration
Fish and Wildlife Service
Missouri River Basins Commission
National Park Service
Yellowstone National Park
Forest Service
Northern Region Office
Beaverhead National Forest
Custer National Forest
Flathead National Forest
Helena National Forest
Intermountain Forest and Range Experiment Station
Office of Environmental Review
Soil Conservation Service

State Agencies:

Cooperative Extension Service
Dept. of Fish, Wildlife and Parks
Dept. of State Lands
State Clearinghouse
Department of Agriculture
Dept. of Health and Environmental
Natural Heritage Program

County Agencies:

Gallatin County Weed District
Sweetgrass County
Meagher County Weed District
Park County Weed District
Madison County

Organizations, Associations, Clubs, etc.

Audubon Society
Ducks Unlimited
Yellowstone Ecosystem Committees
Meagher County Livestock Growers Assoc.
Meagher County Stockgrowers
Montana Wildlands Coalition
National Wildlife Federation
Defenders of Wildlife
Environmental Library, U of M
Idaho National Resource Legal Foundation, Inc.
Montana Wilderness Association
Montana Stockgrowers Association
Nature Conservancy

Rocky Mountain Front Advisory Council
Western Environmental Trade Assoc
Wildlands Resource Association
Sierra Club
Brackett Creek Grazing Assoc.

G. LIST OF PREPARERS[1]

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H. APPENDIX

1. Reference
   a. Bibliography
   b. Glossary
2. Resource Specialist Reports
   a. Biological Evaluation for Noxious Weed Plan
   b. Fisheries Biologist Report
3. Proposed Mechanical Treatment by Districts, Alternative 2
4. Proposed Ground Application of Herbicides by Districts, Alternative 3
5. Proposed Integrated Treatment by Districts, Alternative 4
6. Estimated Cost of Noxious Weed Control by Method of Treatment and District.
7. Detailed Listing of Project by District (Available at Gallatin National Forest Supervisor's Office)
   a. Big Timber Ranger District (D-1)
   b. Livingston Ranger District (D-2)
   c. Gardiner Ranger District (D-3)
   d. Bozeman Ranger District (D-6)
   e. Hebgen Ranger District (D-7)
8. Human Health Risk Analysis
   a. Gallatin National Forest
   b. Northern Region (Available upon request)
9. Pesticide Labels
   a. Tordon 22k (Picloram)
   b. Tordon 2k pellets (Picloram)
   c. 2,4-D Amine

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*These materials are included by reference. Copies of this material is available in the Forest Service office in Bozeman, Montana.

APPENDIX 1b

GLOSSARY

ACCEPTABLE DAILY INTAKE (ADI): The maximum dose of a substance that could be taken daily for a lifetime without adverse health impacts. The ADI is determined by dividing the dose level shown to have no effect on test animals (the no observed effect level of NOEL) by a safety factor used to allow for differences between test animals and humans, to account for test methods used, and to allow for more sensitive humans. Safety factors of 100 or greater are typically used (ADI = NOEL/Safety Factor).

ACID EQUIVALENT (a.e.): The amount of active ingredient expressed in terms of the parent acid.

ACTIVE INGREDIENT (a.i.): The agent primarily responsible for the intended herbicidal effects of a product.

ADJUVANT: Substance added to a spray to act as a wetting or spreading agent, sticker, penetrant, or emulsifier in order to enhance the physical characteristics of the herbicidal materials.

ADSORB: Adherence of a substance to a surface.

AESTHETICS: Evaluations and considerations concerned with the sensory quality of resources (sight, sound, smell, taste, and touch) and especially with respect to judgment about their pleasurable qualities.

ALLEOPATHIC: Pertaining to the suppression of growth of one plant species by another through the release of toxic substances.

AMINE: Any of a group of chemical substances derived from ammonia in which one, two, or three hydrogen atoms have been replaced by one, two, or three hydrocarbon groups.

ANIMAL UNIT MONTH (AUM): The amount of forage required to sustain one mature, 1000 pound cow or the equivalent for 1 month.

ANNUAL PLANT: A plant that completes its life cycle within a year.

BIENNIAL PLANT: A plant that completes its life cycle in 2 years.

BIOACCUMULATION: The accumulation of a substance in the biological componets of an ecosystem.

BIOASSAY: The testing of the effects of chemical substances on live organisms under controlled conditions.

BIOLOGICAL CONTROL: The use of natural enemies to attack a target plant, retard growth, prevent regrowth, or prevent seed formation.

BROWSE: That part of a leaf and twig growth of shrubs, woody vines, and trees on which browsing animals can feed; to consume browse.

BUFFER (STRIP OR ZONE): A zone left untreated with herbicide (at the outer edge of a treated area or along streams) as protection against the effects of treatment.

CARCINOGEN: A substance producing or inciting cancer.

CHEMICAL DEGRADATION: The breakdown of a chemical substance into simpler components through chemical reactions.

CHRONIC TOXICITY: The poisoning effects of a series of doses applied over a long period.

CONCENTRATION: The amount of active ingredient or herbicide equivalent in a quantity of diluent, expressed as lb/gal, ml/liter, etc.

CONGENITAL: Existing at birth but acquired in the uterus rather than inherited.

CONTROL: Reduction of a pest problem to a point where it causes no significant economic damage.

CRITICAL HABITAT: (1) Specific areas within the habitat occupied by a species at the time it is listed under the Endangered Species Act where there are physical or biological features (i) essential to the conservation of the species and (ii) that may require special management considerations or protection, and (2) specific areas outside the habitat occupied by the species at the time it is listed upon the determination by the Secretary of the Interior that such areas are essential for the conservation of the species.

DNA (DEOXYRIBONUCLEIC ACID): Any of the nucleic acids that are the molecular basis of heredity in many organisms.

DOSAGE: The regulation of doses; how often and for how long.

DOSE: The amount of chemical administered at one time. A given quantity of test material that is taken into the body; quantity of material to be administered.

DRIFT: The movement of airborne herbicide particles by air motion or wind away from an intended target area.

ENDANGERED SPECIES: Plant or animal species that are in danger of extinction throughout all or a significant part of their range. See THREATENED SPECIES.

ENVIRONMENTAL IMPACTS STATEMENT (EIS): An analytical document developed for use by decisionmakers to weigh the environmental consequences of a potential action.

EXPOSURE: Application of test material to the external surfaces of a test organisms; takes into consideration route, duration, and frequency.

FORAGE: All browse and herbaceous foods available to grazing animals. Forage may be grazed or harvested for feeding.

FORB: A low-growing herbaceous plant that is not a grass, sedge, or rush.

FORMULATION: (1) A pesticide preparation supplied by a manufacturer for practical use. (2) A manufacturing process by which technical active ingredients are prepared for practical use by mixing with liquid or dry diluents, grinding, or by the addition of emulsifiers, stabilizers, and other adjuvants.

GROUND COVER: Grasses or other plants that keep soil from being blown away or washed away.

HABITAT: The environment in which an organism occurs.

HERBACEOUS: Having little or no woody tissues and usually persisting for a single season.

HERBICIDE: A substance used to inhibit or destroy plant growth. If its effectiveness is restricted to a specific plant or type of plant, it is called a selective herbicide. If it is effective for a broad range of plants, it is called nonselective.

INTEGRATED PEST MANAGEMENT (IPM): A systems approach that uses a combination of techniques (cultural, biological, chemical and regulatory) to achieve economical pest control in an environmentally sound manner. Cultural methods include manual, mechanical, prescribed fire, and grazing.

LC_{50}: The median lethal herbicide concentration rate of a toxicant at which 50 percent of test animals will be killed. It is usually used in testing of fish or other aquatic animals, and is usually expressed in parts per million (ppm).

LD_{50}: The median lethal dose; the size of a single dose of a chemical necessary to kill 50 percent of the organisms in a specific test situation. It is usually expressed in the weight of the chemical per unit of body weight (mg/kg). It may be fed (oral LD_{50}), or administered in the form of vapors (inhalation LD_{50}).

LEACHING: The movement of chemicals through soil by water or the movement of herbicides out of leaves, stems, or roots into the air or soil.

METABOLISM: The chemical processes in living cells by which new material is assimilated and energy is provided for vital processes.

MUTAGEN: A substance that tends to increase the frequency or extent of genetic mutations (changes in hereditary material).

NO OBSERVED EFFECT LEVEL (NOEL): It is the highest level of chemical dosage at which no effect is observed; that is, the safe dosage n the species tested.
NONTARGET VEGETATION: Vegetation which is not expected or not planned to be affected by the treatment.

NOXIOUS WEED: According to the Federal Noxious Weed Act (PL 93-629), a weed that causes disease or has other adverse effects on man or his environment and therefore is detrimental to the agriculture and commerce of the United States and to the public health.

ONCOGENIC (TUMORIGENIC): Capable of producing or inducing tumors in animals. The tumors may be either malignant (cancerous) or benign (non-cancerous).

ORGANOGENESIS: The time period during embryonic development during which all major organs and organ systems are formed. During this period, the embryo is most susceptible to factors interfering with development.

PATHOGEN: A specific causative agent of disease, such as a bacterium or virus.

PELLETED FORMULATION: A dry formulation of herbicide and other components in discrete particles, usually larger than 10 cubic millimeters.

PERENNIAL PLANT: A plant that completes its life cycle in more than 2 years.

PERSISTENCE: The resistance of a herbicide to metabolism and environmental degradation and thus a herbicide's retention of its ability to kill plants for prolonged periods.

PESTICIDE: Any substance or mixture of substances intended for controlling insects, rodents, fungi, weeds, and other forms of plants or animal life that are considered to be pests.

PHOTODEGRADATION: A process of breaking down a substance through reaction to light.

PHYTOTOXIC: Injurious or lethal to plants.

RARE SPECIES (PLANTS): Plant species not officially listed as threatened or endangered but that are undergoing a status review or are proposed for listing by either Federal Register notices published by the Secretary of the Interior or the Secretary of Commerce or by comparable state documents.

RATE: The amount of active ingredient or acid equivalent applied per unit area or other treatment unit.

RESEARCH NATURAL AREA: A physical or biological unit in which current natural conditions are maintained insofar as possible. In such areas, activities such as grazing and vegetation manipulation are prohibited unless they replace natural processes and contribute to the protection and preservation of an area. Such recreation activities as camping and gathering plants are discourage.

RESIDUE: That quantity of herbicide, its degradation products, and/or its metabolites remaining on or in the soil, plant parts, animal tissues, whole organisms, and surfaces.

RESIDUAL HERBICIDE: A herbicide that persists in the soil and injures or kills germinating weed seedlings, over a relatively short period of time.

RHIZOME: An underground root-like stem, that produces roots and leafy shoots and provides a means for some plants to reproduce.

RIPARIAN: Pertaining to or located along a streambank or other water bodies, such as ponds, lakes, reservoirs, or marshes.

RISK: The probability that a substance will produce harm under specified conditions.

SAFETY: The reciprocal of risk, i.e., the probability that harm will not occur under specified conditions.

SCOPING: The process by which significant issues relating to a proposal are identified for environmental analysis. Scoping includes eliciting public comment on the proposal, evaluating concerns, and developing alternatives for consideration.

SEDIMENTATION: The process or action of depositing sediment.

SELECTIVE PESTICIDE: A chemical that is more toxic to some species than to others.

SPOT TREATMENT: A herbicide applied over a small continuous restricted area of a whole unit; i.e., treatment of spots or patches of brush within a larger field.

TERATOGEN: A substance tending to cause development malformations, or structural abnormalities, of prenatal origin, present at birth or manifested shortly afterwards; the ability to produce birth defects.

THREATENED SPECIES: Plant or animal species that are not in danger of extinction but are likely to become so within the foreseeable future throughout all or a significant portion of their range. See ENDANGERED SPECIES.

TOLERANCE: Acceptable level of pesticide residues. (1) Capacity to withstand pesticide treatment without averse effects on normal growth and function (2) the maximum residue concentration legally allowed for a specific pesticide, its metabolites, or breakdown products, in or on a particular raw agricultural product, processed food, or feed item. Expressed as parts per million (ppm).

TOXICITY: (1) The capacity or property of a substance to cause any adverse effects. It is based on scientifically verifiable data from animal or human exposure tests. (2) That specific quantity of a substance which may be expected, under specific conditions, to do damage to a specific living oprganism.

TRANSLOCATION: Movement of a pesticide or other substance within a plant via the phloem or xylem.

WEED CONTROL: The process of limiting weed infestations or killing weeds for aesthetic, economic, public health, or other reasons.

WEED ERADICATION: The elimination of all live parts of plants and viable seeds of a weed from a site.

WEED SUPPRESSION: The process of retarding weed growth.

WEED: A plant out of place or growing where not desired.

WEED-INFESTED ACRE: An acre of land any part of which that is infested with weeds.

WILDERNESS: An area designated by Congress as part of the National Wilderness Preservation System. Wilderness areas are generally undeveloped Federal lands that retain their primeval character and influence without improvements or human habitation.

APPENDIX 2A

BIOLOGICAL EVALUATION FOR THE NOXIOUS WEED PLAN

GALLATIN NATIONAL FOREST

INTRODUCTION

This evaluation is being done for the noxious weed plan for the Gallatin Naitonal Forest. The selected alternative, integrated pest management, involves chemical control as the primary method. Other methods include mechanical and biocontrol agents. With chemical control, toxic substances will be used, and thus their potential impact on Threatened and Endangered wildlife and plant species need to be evaluated.

The toxic substances to be used for chemical control of noxious weeds include picloram and 2-4-D. Both have an identified toxic affect on invertebrates, fish, birds and mammals (USDA Technical Report # 633, 1984). Toxicity depends on dosage, exposure length, and environmental conditions at the time of exposure.

THREATENED AND ENDANGERED PLANTS AND WILDLIFE AND IDENTIFIED HABITAT

The Gallatin National Forest has no threatened or endangered plants. It does have the threated grizzly bear and the endangered bald eagle. The endagered peregine falcon is currently being reestablished on the forest, and we expect to have resident nesting birds within the next several years.

The Gallatin National Forest has 754,288 acres of grizzly bear recovery habitat, which includes management situation areas 1 and 2. The location of important gizzly bear area for females rearing their young are fairly well identified. These areas generally occur close to and adjacent to Yellowstone National Park. Density of grizzly bears declines as distance from the Park increases. However, sporadic appearances of grizzly bears, especially younger wandering males, can be expected to occur almost any where on the forest.

The location of the bald eagle and peregrine falcon occupied/hacking habitat on the forest is localized at present to 2 areas. Several bald eagle pairs nest on Hebgen Lake. And the 2 peregrine falcon hacking sites are located in Gallatin Canyon. These sites are monitored to determine if and when adult peregrines will reoccupy the sites and nest there. Any new nesting sites for both species will be targeted for special management, just as existing sites are now.

PROJECT IMPACTS

For the bald eagle and peregrine falcon, the known location of existing occupied habitat makes coordination with weed control relatively easy. It is

largely a matter of keeping chemical control from contaminating the food supply for either species within potential or known hunting areas. Both species will do most of their hunting within 1-2 miles of the nest site. A 2 mile radius around each known nest site would serve as an adequate buffer for excluding chemical control. If chemical control of weeds was felt to be the only feasible means of controling weeds within this habitat radius, further planning, consultation, and review with the U.S. Fish and Wildlife Service would be necessary. Chemical contamination of prey species, such as fish, mammals and birds, would impact any predatory species. Contaminated prey may have an increased vulnerability and attractiveness to predators, due to behavior abnormalities and physical disabilities caused from ingesting pesticides.

The grizzly bear has a low probability of being impacted by the weed control program. This is due to the small amount of area that will be treated within grizzly bear habitat (65 acres) as well as the wide ranging nature of the bear. It is unlikely that they will encounter the treatment areas within the first severeal weeks of treatment, when chemicals are most toxic. The target plant species for control, which include leafy sprurge, spotted knapweed, Canada thistle, musk thistle, whitetop, dalmation toadflax and yellow toadflax are not preferred grizzly bear foods. And the majority of the treatment areas include roadsisdes, which bears generally avoid. Bears also usually avoid trailheads, another potential treatment site, due to the human activity. And finally, the bears large size requires that they consume a large amount of the chemical. This is unlikely given that normal control procedures are followed. The normal means of grizzly bear consuption would likely be through the consumption of contaminated berries, plants, small mammals, or fish. The latter pathway probably represents the most likely hazzard, where an accidental fish kill resulted from chemical contamination of a stream. Profect design should prevent such an incident. However, the potential needs to be recognized and guarded against.

CONCLUSIONS

As a result of this analysis as well as an informal consultation with Dale Harmes of the U.S. Fish and Wildlife Service on 5/13/86, I believe that the proposed noxious week program will have no effect on threatened or endangered wildlife species on the Gallatin National Forest. This is provided that adequate precautions are taken to prevent unnecessary and excessive contamination of the localized treatment areas in management situation 1 and 2 grizzly bear habitat, so that contaminated prey species are not made available to the bear, particularily fish, and that further project analysis and review is completed if projects are planned at future dates within a 2 mile radius of bald eagle nesting habitat, and peregrine falcon nesting and hacking sites.

Sara Jane Johnson
Zone District Biologist
Gallatin National Forest

LITERATURE CITED

USDA. 1984. Pesticide background statements. Volume I. Herbicides. Agriculture Handbook 633.

APPENDIX 2B

United States Department of Agriculture | Forest Service | Gallatin NF

REPLY TO: 2150 Date: May 1, 1986

SUBJECT: Fishery Input into the Gallatin's Weed Control EIS

TO: Forest Supervisor, GNF

This is the fishery input to the Gallatin NF's EIS being written for chemical weed control. Primary herbicides that the forest proposes to use are Tordon and 2,4-D. Impacts to fisheries involving application of chemicals in and around water depend upon toxicity of the chemical on the concerned fish species, duration or persistence of the chemical, ability of the chemical to reach live water in a toxic state and means of chemical application.

1. Tordon: Tordon is the label name for picloram and is considered highly mobile and persistent in soil. It can remain active in the soil as long as three years following initial application.

   The lethal dose for fish varies among studies and depends upon the chemical form of herbicide used. The 96 hour LC50 (level of chemical concentration in the water that is needed to kill 50% of the fish in a 96 hour period) for cutthroat trout is 1.5 ppm for potassium salt and 4.8 ppm for trichloropicolinic acid (90-100% pure). Reports in the EIS developed by the Gallatin NF refers to a LC50 of 50-58 ppm for Tordon for an unspecified length of exposure time.

2. 2,4-D: The dimethyl amine salt form of 2,4-D is low in both soil mobility and persistence. The 96 hour LC50 is 100 ppm for rainbow trout. Another study shows a 96 TLM (median tolerance limit which is the concentration of toxicant that will allow 50% of the trout to survive 96 hours) of 1 mg/l for esters and 900 mg/l for alkanolamine.

   Of the two chemicals, Tordon (picloram) is the most toxic, has the most mobility in soils and is the most persistent.

Recommendations:

It is federal law that both chemicals must be used in strict compliance with the instructions on the label. It is of particular importance that Tordon be used in a manner where it will not contaminate water that could be used for drinking or other domestic uses. Coverage must be limited to no greater than 25% of the acreage found in any one drainage. It must not be used where a sandy, porous surface and substrate overlies ground water closer than 10 feet below the surface. Use should be limited to spot treatment when working slopes of significant gradient. It must not be applied within one half mile of where stream or pond water, which drains from the treated watershed, may be drawn to irrigate suseptible broadleaf plants.

A major fishery concern involving the use of herbicides on the Forest involve small, rearing streams that have little potential for dilution. The toxic effects of Tordon and 2,4-D have a more of an apparent influence on young, developing fish at low chemical concentrations then they have on adult fish. Therefore, it is imperative that proper precautions are used during application to prevent chemicals from entering important spawning and rearing aquatic systems.

The Montana Fish, Wildlife and Parks recommend using Tordon in only those areas that are away from streams and standing water. The chemical 2,4-D should be carefully applied to these critical areas instead.

It is recommended that the management constraints outlined in the Gallatin's EIS be adopted in the Gallatin's EIS. Constraints emphasizing the protection of water resources include:

1. No herbicides will be applied directly to any standing or running water or where surface water from treated areas can run off into live water sources.

2. Tordon will not be sprayed within 100 feet of a stream, pond or water source, within the normal high water level of a stream or pond-whichever is greater. It will not be sprayed or allowed to drift into the inner banks of ditches or water channels that carry water.

It is important that Tordon be applied so that residues in streams and lakes do not exceed 290 microgram/liter in the first major rainfall after application.

/s/James R. Lloyd

JAMES R. LLOYD
Zone Fisheries Biologist

APPENDIX 3

Proposed Mechanical Treatment by Districts

Alternative #2

Big Timber Ranger District (D-1)

PROJECT NAME	TARGET WEED	NET SIZE ACRE	ACRE BY METHOD TILL	MOW	GRUB	COST $ M	PROJECT TYPE 1/
Iron Mtn Road	Spotted Knapweed	10.0			10.0	1.54	ROW
Froze to Death Cr	Spotted Knapweed	0.25			0.25	0.039	OR
Graham Creek	Spotted Knapweed	0.10			0.10	0.015	OR
M. Boulder Admin. Past.	Leafy Spurge	0.01			0.01	n/a	OR
Contact Cattle Allot	Leafy Spurge	5.0			5.0	.770	OR
M. Bridger Road	Spotted Knapweed	3.0			3.0	.462	ROW
Deer Cr Cattle Allot	Leafy Spurge	39.0			39.0	6.006	OR/RIP
Subtotal		57.36				8.832	

Livingston Ranger District (D-2)

PROJECT NAME	TARGET WEED	NET SIZE ACRE	ACRE BY METHOD TILL	MOW	GRUB	COST $ M	PROJECT TYPE
Cottonwood Road	Spotted Knapweed	5.0			5.0	.770	ROW/RIP
Shields River Road System	Canada Thistle Houndstongue	10.0			10.0	1.54	ROW/RIP
West Pine Creek Road & EOR	Canada Thistle Spotted Knapweed Houndstongue Muskthistle	2.5			2.5	.385	ROW/RIP
Suce Creek Road & EOR	Spotted Knapweed Houndstongue Canada Thistle	2.5			2.5	.385	ROW/RIP
Deep Creek Road and Horse Pasture	Canada Thistle Houndstongue	1.4			1.4	.216	ROW
Main Mill Creek	Spotted Knapweed Canada Thistle Houndstongue	13.25			13.25	2.041	ROW/RIP
Gold Prize Road and Mine Site	Spotted Knapweed	1.0			1.0	.154	ROW/RIP
West Fork Mill Cr & EOR	Spotted Knapweed Canada Thistle Houndstongue	2.0			2.0	.308	ROW/RIP
Emigrant Gulch/ Chico Horse Pasture	Spotted Knapweed Houndstongue	2.5			2.5	.385	ROW/RIP
Big Creek Station and Access Road	Spotted Knapweed Houndstongue	2.0			2.0	.308	ROW/RIP/CCC
Smith Creek	Spotted Knapweed Houndstongue Canada Thistle	20.5			20.5	3.157	ROW/RIP
Rock Creek-North	Leafy Spurge	0.25			0.25	0.039	OR
Strickland Creek	Spotted Knapweed Houndstongue Canada Thistle	0.25			0.25	0.039	OR
Subtotal		63.15				9.727	

Gardiner Ranger District (D-3)

PROJECT NAME	TARGET WEED	NET SIZE ACRE	ACRE BY METHOD TILL	MOW	GRUB	COST $ M	PROJECT TYPE
Divide Cr Timber Sale	Spotted Knapweed Canada Thistle Houndstongue	1.0			1.0	.154	OR
Divide Cr Road	Spotted Knapweed Canada Thistle Houndstongue	6.0			6.0	.924	ROW/RIP
Tom Miner-Sunlight Road	Spotted Knapweed Canada Thistle Houndstongue	6.0			6.0	.924	ROW/RIP
Eagle Creek Road	Spotted Knapweed Canada Thistle Houndstongue Toadflax	5.0			5.0	.770	ROW/RIP
Jardine Area Road System	Spotted Knapweed Canada Thistle Houndstongue	14.0			14.0	2.156	ROW/RIP
LaDuke Springs Trailhead	Spotted Knapweed	1.0			1.0	.154	ROW
Joe Brown Trailhead	Spotted Knapweed	1.0			1.0	.154	ROW
Blanding Admin Pasture	Spotted Knapweed	1.0			1.0	.154	OR/RIP
Rex Coulee	Spotted Knapweed	0.5			0.5	.770	OR
Cinnabar RR Right-of-Way	Spotted Knapweed	0.25			0.25	.039	ROW
Yankee Jim Admin Pasture	Spotted Knapweed	0.50			0.50	.077	ROW
Palmer Mtn Coop Timber Sale	Spotted Knapweed	14.0			14.0	2.156	OR
Subtotal		50.25				8.432	

Bozeman Ranger District (D-6)

PROJECT NAME	TARGET WEED	NET SIZE ACRE	ACRE BY METHOD TILL	MCW	GRUB	COST $ M	PROJECT TYPE
Moser Jumpoff Timber Sale & Road	Spotted Knapweed Houndstongue Canada Thistle	4.2			4.2	.647	ROW/RIP
Beaver Cr Timber Sale	Spotted Knapweed Houndstongue Canada Thistle	4.0			4.0	.616	ROW/RIP
Bear Creek Timber Sale	Spotted Knapweed Houndstongue Canada Thistle	5.1			5.1	.786	ROW/RIP
Miles Grassy Timber Sale	Spotted Knapweed Houndstongue Canada Thistle	3.1			3.1	.478	ROW
Pine Slushman Timber Sale	Spotted Knapweed Houndstongue Canada Thistle	3.1			3.1	.478	ROW/RIP
Stone Creek Timber Sale and Road	Spotted Knapweed Houndstongue Canada Thistle	4.2			4.2	.647	ROW/RIP
Bozeman Cr Timber Sale	Spotted Knapweed Houndstongue Canada Thistle	4.0			4.0	.616	ROW/RIP
Middle Cr Timber Sale	Spotted Knapweed	4.0			4.0	.616	ROW/RIP
"M" Site	Leafy Spurge	24.0			24.0	3.696	OR/CCC
Battleridge Admin. Site	Houndstongue Canada Thistle	11.0			11.0	1.694	CCC
Squaw Cr - King Admin. Sites	Houndstongue Canada Thistle	5.0			5.0	.770	OR
Flathead Pass Road	Spotted Knapweed Houndstongue Canada Thistle	2.0			2.0	.308	ROW
Brackett Cr Road Junction	Spotted Knapweed Houndstongue Canada Thistle	2.0			2.0	.308	ROW/RIP
Hyalite Road	Spotted Knapweed	5.0			5.0	.770	ROW/RIP

	Canada Thistle				
Hyalite-Buckskin Road	Spotted Knapweed Canada Thistle	5.0	5.0	.770	ROW/RIP
Spanish Cr Admin Site	Spotted Knapweed	2.0	2.0	.308	CCC/RIP
Cascade Cr Trailhead;	Spotted Knapweed	1.0	1.0	.154	ROW
Greek Cr Campground	Spotted Knapweed	0.50	0.50	.077	CCC
Swann Cr Campground	Spotted Knapweed	0.50	0.50	.077	CCC/RIP
Subtotal		89.7		13.816	

Hebgen Lake Ranger District (D-7)

PROJECT NAME	TARGET WEED	NET SIZE ACRE	ACRE BY METHOD TILL	MOW	GRUB	COST $ M	PROJECT TYPE
Visitor Center	Spotted Knapweed	7.0			7.0	1.078	OCC
Horse Butte	Canada Thistle	4.0			4.0	.616	ROW
Race Oval	Spotted Knapweed	3.0			3.0	.462	ROW
Subtotal		14.0				2.156	
TOTAL(All Districts)		274.46				42.963	

Costs for handgrubbing noxious weeds were based on costs developed at the Kings Hill Ranger District, Gallatin National Forest for similar projects.

1/ Sites are classified by location types. ROW indicates that treatment occurs near a road right-of-way. RIP indicates treatment occurs near a piparian habitat (streams, lakes, etc.). OR indicates that treatment occurs on genneral open range or forest lands. OCC indicates that treatment occurs on a potentially occupied site such as a campground or administrative site.

APPENDIX 4

Proposed Ground Application of Herbicides by District

Alternative #3

Big Timber Ranger District (D-1)

Project Name	Target Weed	Net Size Acre	Herbicide Amount Pounds of Active Ingredient 2,4-D	Picloram	Cost M $	Project 1/ Type
Iron Mtn Road	Spotted Knapweed	10.0	20.0 lbs	2.5 lbs	.749	ROW
Froze to Death Cr	Spotted Knapweed	0.25		0.0625 lbs	.019	OR
Graham Creek	Spotted Knapweed	0.10		0.025 lbs	.007	OR
M. Boulder Admin Pasture	Leafy Spurge	0.01		0.015 lbs	n/a	OR
Contact Cattle Allot	Leafy Spurge	5.0		7.5 lbs	.375	OR
Main Bridger Road	Spotted Knapweed	3.0	6.0 lbs	0.75 lbs	.225	ROW
Deer Cr. Cattle Allot.	Leafy Spurge	12.0	2.0 lbs	18.0 lbs	.899	OR/RIP
Deer Cr. Cattle Allot.	Leafy Spurge	15.0	4.0 lbs	22.5 lbs	1.124	OR/RIP
Deer Cr. Cattle Allot.	Leafy Spurge	12.0	2.0 lbs	18.0 lbs	.899	OR/RIP
Subtotal		57.36	34.0 lbs	69.3525 lbs	4.297	

Livingston Ranger District (D-2)

Project Name	Target Weed	Net Size Acre	Herbicide Amount Pounds of Active Ingredient 2,4-D	Picloram	Cost M $	Project Type
Cottonwood Road	Spotted Knapweed	5.0	10.0 lbs	1.25 lbs	.214	ROW/RIP
Shields River Road System	Canada Thistle Houndstongue	10.0	20.0 lbs		.427	ROW/RIP
West Pine Creek Road and EOR	Canada Thistle Spotted Knapweed Houndstongue Muskthistle	2.5	5.0 lbs	0.625 lbs	.107	ROW/RIP
Suce Creek Road and EOR	Spotted Knapweed Houndstongue Canada Thistle	2.5	5.0 lbs	0.625 lbs	.107	ROW/RIP
Deep Creek Road and Horse Pasture	Canada Thistle Houndstongue	1.4	2.8		.060	ROW
Main Mill Creek	Spotted Knapweed Canada Thistle Houndstongue	13.25	26.50 lbs	3.31 lbs	.566	ROW/RIP
Gold Prize Road and Mine Site	Spotted Knapweed	1.0		0.25 lbs	.043	ROW/RIP
West Fork Mill Creek and EOR	Spotted Knapweed Canada Thistle Houndstongue	2.0		0.50 lbs	.085	ROW/RIP
Emigrant Gulch/ Chico HOrse Pasture	Spotted Knapweed Houndstongue	2.5	5.0 lbs	0.625 lbs	.107	ROW/RIP
Big Creek Station and Access Road	Spotted Knapweed Houndstongue	2.0	4.0 lbs	0.50 lbs	.085	ROW/RIP/CCC
Smith Creek	Spotted Knapweed Houndstongue Canada Thistle	20.5	41.0 lbs	5.12 lbs	.875	ROW/RIP
Rock Creek - North	Leafy Spurge	0.25	0.50 lbs	0.625 lbs	.011	OR
Strickland Creek	Spotted Knapweed Houndstongue Canada Thistle	0.25	0.50 lbs	0.625 lbs	.011	OR
Subtotal		63.15	120.3 lbs	14.055 lbs	2.698	

Gardiner Ranger District (D-3)

Project Name	Target Weed	Net Size Acre	Herbicide Amount Pounds of Active Ingredient 2,4-D	Picloram	Cost M $	Project Type
Divide Cr Timber Sale	Spotted Knapweed Canada Thistle Houndstongue	1.0	2.0 lbs	0.50 lbs	.062	OR
Divide Creek Road	Spotted Knapweed Canada Thistle Houndstongue	6.0	12.0 lbs	3.0 lbs	.370	ROW/RIP
Tom Miner - Sunlight Road	Spotted Knapweed Canada Thistle Houndstongue	6.0	12.0 lbs	3.0 lbs	.370	ROW/RIP
Ealge Creek Road	Spotted Knapweed Canada Thistle Houndstongue	5.0	10.0 lbs	2.5 lbs	.308	ROW/RIP
Jardine Area Road System	Spotted Knapweed Canada Thistle Houndstongue	14.0	28.0 lbs	7.0 lbs	.864	ROW/RIP
LaDuke Springs Trailhead	Spotted Knapweed	1.0	2.0 lbs	0.50 lbs	.062	ROW
Joe Brown Trailhead	Spotted Knapweed	1.0	2.0 lbs	0.50 lbs	.062	ROW
Blanding Admin Pasture	Spotted Knapweed	1.0		0.50 lbs	.062	OR/RIP
Rex Coulee	Spotted Knapweed	0.5		0.25 lbs	.031	OR
Cinnabar RR Right-of-Way	Spotted Knapweed	0.25		0.125 lbs	.015	ROW
Yankee Jim Admin Pasture	Spotted Knapweed	0.50	1.0 lbs	0.25 lbs	.031	ROW
Palmer Mtn Co-op Timber Sale	Spotted Knapweed Canada Thistle	14.0	28.0 lbs	7.0 lbs	.864	OR
Subtotal		50.25	97.0 lbs	25.125 lbs	3.101	

Bozeman Ranger District (D-6)

Project Name	Target Weed	Net Size Acre	Herbicide Amount Pounds of Active Ingredient 2,4-D	Picloram	Cost M $	Project Type
Moser Jumpoff Timber Sale & Road	Spotted Knapweed Houndstongue Canada Thistle	4.2	8.4 lbs	2.1 lbs	.351	ROW/RIP
Beaver Creek Timber Sale	Spotted Knapweed Houndstongue Canada Thistle	4.0	8.0 lbs	2.0 lbs	.334	ROW/RIP
Bear Creek Timber Sale	Spotted Knapweed Houndstongue Canada Thistle	5.1	10.2 lbs	2.55 lbs	.426	ROW/RIP
Miles Grassy Timber Sale	Spotted Knapweed Houndstongue Canada Thistle	3.1	6.2 lbs	1.55 lbs	.259	ROW
Pine Slushman Timber Sale	Spotted Knapweed Houndstongue Canada Thistle	3.1	6.2 lbs	1.55 lbs	.259	ROW/RIP
Stone Creek Timber Sale & Road	Spotted Knapweed Houndstongue Canada Thistle	4.2	8.4 lbs	2.1 lbs	.351	ROW/RIP
Bozeman Cr Timber Sale	Spotted Knapweed Houndstongue Canada Thistle	4.0	8.0 lbs	2.0 lbs	.334	ROW/RIP
Middle Cr Timber Sale	Spotted Knapweed	4.0	8.0 lbs	2.0 lbs	.334	ROW/RIP
"M" Site	Leafy Spurge	24.0		24. lbs	2.006	OR/OCC
Battleridge Admin Site	Houndstongue Canada Thistle	11.0	22.0 lbs		.920	OCC
Squaw Cr - King Admin. Sites	Houndstongue Canada Thistle	5.0	10.0 lbs		.418	OR
Flathead Pass Road	Spotted Knapweed Houndstongue Oxeye Daisy	2.0	4.0 lbs	1.0 lb	.167	ROW
Brackett Cr. Road Junction	Spotted Knapweed Houndstongue Canada Thistle	2.0	4.0 lbs	1.0 lb	.167	ROW/RIP

Hyalite Road	Spotted Knapweed Canada Thistle	5.0	10.0 lbs	2.5 lbs	.418	ROW/RIP
Hyalite-Buckskin Road	Spotted Knapweed Canada Thistle	5.0	10.0 lbs	2.5 lbs	.418	CCC/RIP
Spanish Creek Admin Site	Spotted Knapweed	2.0	4.0 lbs	1.0 lbs	.167	ROW
Cascade Cr Trailhead	Spotted Knapweed	1.0	2.0 lbs	0.50 lbs	.084	CCC
Greek Creek Campground	Spotted Knapweed	0.50	1.0 lbs	0.25 lbs	.042	CCC
Swann Creek Campground	Spotted Knapweed	0.50	1.0 lbs	0.25 lbs	.042	CCC/RIP
Subtotal		89.7	131.4 lbs	48.85 lbs	>.497	

Hebgen Lake Ranger District (D-7)

Project Name	Target Weed	Net Size Acre	Herbicide Amount Pounds of Active Ingredient 2,4-D	Picloram	Cost M $	Project Type
Visitor Center	Spotted Knapweed	7.0		4.9 lbs	.350	OOC
Horse Butte	Canada Thistle	4.0		2.8 lbs	.200	ROW
Race Oval	Spotted Knapweed	3.0		2.1 lbs	.150	ROW
Subtotal		14.0	0.0	9.8 lbs	0.7	
TOTAL		274.45	382.7	167.1825	18.293	

The above costs were determined from averages each District felt were representative for their area. Travel time, access to the site, etc. were considered in when determining these costs.

1/ Sites are classified by location types. ROW indicates that treatment occurs near a road right-of-way. RIP indicates treatment occures near a riparian habitat (streams, lakes, etc.). OR indicates that treatment occurs on general open range or forest lands. OOC indicates that treatment occurs on a potentially occupied site such as a campground or administrative site.

APPENDIX 5

Proposed Integrated Treatment by District

Big Timber Ranger District (D-1)

Project Name	Target Weed	Net Size Acre	Acre Grub	Herbicide Amount lbs of Active Ingredient 2,4-D	Picloram	Cost $ M	Project Type
Iron Mtn Road	Spotted Knapweed	10.0	0	20.0 lbs	2.5 lbs	.75	ROW
Froze to Death Cr	Spotted Knapweed	0.25	.1	0	.0375 lbs	.027	OR
Graham Creek	Spotted Knapweed	0.10	.05	0	.0125 lbs	.011	OR
M. Boulder Admin Past	Leafy Spurge	0.01	0	0	.015 lbs	.007	OR
Contract Cattle Allot	Leafy Spurge	5.0	0	0	7.5 lbs	.375	OR
M. Bridger Road	Spotted Knapweed	3.0	0	6.0 lbs	0.75 lbs	.225	ROW
Deer Cr Cattle Allot	Leafy Spurge	39.0	0	8.0 lbs	58.5 lbs	2.925	
Subtotal		57.36	.15	34.0 lbs	69.315 lbs	4.32	

Livingston Ranger District (D-1)

Project Name	Target Weed	Net Size Acre	Acre Grub	Herbicide Amount lbs of Active Ingredient 2,4-d	Picloram	Cost $ M	Project Type
Cottonwood Road	Spotted Knapweed	5.0	0	10.0 lbs	1.25 lbs	.210	ROW/RIP
Shield River Road System	Canada Thistle Houndstongue	10.0	0	20.0 lbs	0	.420	ROW/RIP
West Pine Creek Road & EOR	Canada Thistle Spotted Knapweed Houndstongue Muskthistle	2.5	0	5.0 lbs	0.625 lbs	.105	ROW/RIP
Suce Cr Road & EOR	Spotted Knapweed Houndstongue Canada Thistle	2.5	1.25	2.5 lbs	0.3125 lbs	.245	ROW/RIP
Deep Cr Road and Horse Pasture	Canada Thistle Houndstongue	1.4	.7	1.4 lbs	0	.137	ROW
Main Mill Creek	Spotted Knapweed Canada Thistle Houndstongue	13.25	0	26.5 lbs	3.31 lbs	.557	ROW/RIP
Gold Prize Road and Mine Site	Spotted Knapweed	1.0	0	0	.25	.042	ROW/RIP
West Fork Mill Cr and EOR	Spotted Knapweed Canada Thistle Houndstongue	2.0	0	0	0.50 lbs	.084	ROW/RIP
Emigrant Gulch Chico Horse Pasture	Spotted Knapweed Houndstongue	2.5	0	5.0 lbs	0.625 lbs	.105	ROW/RIP
Big Cr Station and Access Road	Spotted Knapweed Houndstongue	2.0	0	4.0 lbs	0.50 lbs	.042	ROW/RIP/OCC
Smith Creek	Spotted Knapweed Houndstongue Canada Thistle	20.5	0	41.0 lbs	5.12 lbs	.861	ROW/RIP
Rock Creek - North	Leafy Spurge	0.25	0	0.5 lbs	0	.011	OR
Strickland Creek	Spotted Knapweed Houndstongue Canada Thistle	0.25	0	0.5 lbs	0.625 lbs	.011	OR
Subtotal		63.15	1.95	116.4	18.754	2.83	

Gardiner Ranger District (D-3)

Project Name	Target Weed	Net Size Acre	Acre Grub	Herbicide Amount lbs of Active Ingredient 2,4-d	Picloram	Cost $ M	Project Type
Divide Cr Timber Sale	Spotted Knapweed Canada Thistle Houndstongue	1.0	1.0	0	0	.154	OR
Divide Cr Road	Spotted Knapweed Canada Thistle Houndstongue	6.0	0	12.0	3.0 lbs	.372	ROW/RIP
Tom Miner - Sunlight Road	Spotted Knapweed Canada Thistle Houndstongue	6.0	0	12.0 lbs	3.0 lbs	.372	ROW/RIP
Eagle Cr Road	Spotted Knapweed Canada Thistle Houndstongue Toadflax	5.0	0	10.0 lbs	2.5 lbs	.310	ROW/RIP
Jardine Area Road System	Spotted Knapweed Canada Thistle Houndstongue	14.0	0	28.0 lbs	7.0 lbs	.868	ROW/RIP
LaDuke Springs Trailhead	Spotted Knapweed	1.0	1.0	0	0	.154	ROW
Joe Brown Trailhead	Spotted Knapweed	1.0	1.0	0	0	.154	ROW
Blanding Admin Pasture	Spotted Knapweed	1.0	.5	0	.25	.093	OR/RIP
Rex Coulee	Spotted Knapweed	0.5	.25	0	.125	.055	OR
Cinnabar RR Right-of-Way	Spotted Knapweed	0.25	.25	0	0	.039	ROW
Yankee Jim Admin. Pasture	Spotted Knapweed	0.50	.25	0.516	.125	.055	ROW
Palmer Mtn Co-op Timber Sale	Spotted Knapweed Canada Thistle	14.0	0	28.0 lbs	7.0 lbs	.868	OR
Subtotal		50.25	4.25	90.5 lbs	23.0 lbs	3.494	

Bozeman Ranger District (D-6)

Project Name	Target Weed	Net Size Acre	Acre Grub	Herbicide Amount lbs of Active Ingredient 2,4-d	Picloram	Cost $ M	Project Type
Moser Jumpoff Timber Sale & Road	Spotted Knapweed Houndstongue Canada Thistle	4.2	0	8.4 lbs	2.1 lbs	.353	ROW/RIP
Beaver Cr Timber Sale	Spotted Knapweed Houndstongue Canada Thistle	4.0	0	8.0 lbs	2.0 lbs	.336	ROW/RIP
Bear Cr Timber Sale	Spotted Knapweed Houndstongue Canada Thistle	5.1	0	10.2 lbs	2.55 lbs	.429	ROW/RIP
Miles Grassy Timber Sale	Spotted Knapweed Houndstongue Canada Thistle	3.1	0	6.2 lbs	1.55 lbs	.260	ROW
Pine Slushman Timber Sale	Spotted Knapweed Houndstongue Canada Thistle	3.1	0	6.2 lbs	1.55 lbs	.260	ROW/RIP
Stone Cr Timber Sale and Road	Spotted Knapweed Houndstongue Canada Thistle	4.2	0	8.4 lbs	2.1 lbs	.353	ROW/RIP
Bozeman Creek Timber Sale	Spotted Knapweed Houndstongue Canada Thistle	4.0	2.0	4.0 lbs	1.0 lbs	.476	ROW/RIP
Middle Creek Timber Sale	Spotted Knapweed Houndstongue Canada Thistle	4.0	0	8.0 lbs	2.0 lbs	.336	ROW/RIP
"M" Site	Leafy Spurge	24.0	0	0	24.0 lbs	2.016	OR/CCC
Battleridge Admin. Site	Houndstongue Canada Thistle	11.0	0	22.0 lbs	0	.924	CCC
Squaw Creek King Admin. Site	Houndstongue Canada Thistle	5.0	0	10.0 lbs	0	.420	OR
Flathead Pass Road	Spotted Knapweed Houndstongue Okeye Daisy	2.0	0	4.0 lbs	1.0 lbs	.168	ROW
Brackett Creek Road Junction	Spotted Knapweed Houndstongue	2.0	0	4.0 lbs	1.0 lbs	.168	ROW/RIP

	Canada Thistle						
Hyalite Road	Spotted Knapweed Canada Thistle	5.0	1.25	7.5 lbs	1.875 lbs	.508	ROW/RIP
Hyalite-Buckskin Rd	Spotted Knapweed Canada Thistle	5.0	1.25	7.5 lbs	1.875 lbs	.508	OOC/RIP
Spanish Creek Admin. Site	Spotted Knapweed	2.0	1.0	2.0 lbs	.5 lbs	.238	ROW
Cascade Cr Trailhead	Spotted Knapweed	1.0	0	2.0 lbs	0.50 lbs	.084	OOC
Creek Cr Campground	Spotted Knapweed	0.50	.25	0.5 lbs	0.125 lbs	.025	OOC
Swan Cr Campground	Spotted Knapweed	0.50	.25	0.5 lbs	0.125 lbs	.060	OOC/RIP
Subtotal		89.7	6.	119.4 lbs	45.85 lbs	7.922	

Hebgen Lake Ranger District (D-7)

Project Name	Target Weed	Net Size Acre	Acre Grub	Herbicide Amount lbs of Active Ingredient 2,4-d	Picloram	Cost $ M	Project Type
Visitor Center	Spotted Knapweed	7.0	0	0	4.9 lbs	.350	OCC
Horse Butte	Canada Thistle	4.0	2.0	0	1.4 lbs	.408	ROW
Race Oval	Spotted Knapweed	3.0	0	0	2.1 lbs	.150	ROW
Subtotal		14.0	2.0	0	8.4 lbs	.908	
Total		274.46	14.36	360.3	165.319 lbs	19.474	

1/ Sites are classifed by location types. ROW indicates that treatment occurs near a road right-of-way. RIP indicates treatment occurs near a riparian habitat (streams, lakes, etc.). OR indicates that treatment occurs on general open range or forest lands. OCC indicates that treatment occurs in a potetially occupied site such as a campground or administrative site.

APPENDIX 6

Estimated Cost of Noxious Weed Control by Method of Treatment and District

Big Timber Ranger District (D-1)

$50-$75/Acre Spraying Backpack Sprayer

No Mechanical Treatment

No Biological Control

Livingston Ranger District (D-2)

$10-$12/Acre Tordon 2K 1/4 lb

$12-$14/Acre Tordon 22K - 2,4-D Mix

$20/Acre Labor - tordon 2K Access

$75/Acre

$30/hr plus chemical - County Costs

$28/hr Fctourous - $50/Mile

$40 - Low End $85/Acre i.e. Travel Time

Pulled Up Small Infestations, Weevils On Thistle

Gardiner Ranger District (D-3)

$55-$60/Acre Spraying

No Mechanical Treatment

No Biological Control

Bozeman Ranger District (D-6)

$80-$100/Acre Pellets

$20-$30/Acre Spray

No Mechanical Control

Biological Control
Seed-head Weevil (Rhinocyclus Conicus) on Muskthistle at Battleridge.

Hawkmoth (Hyles Euphorbice) on Leafy Spurge - "M"

$50/Acre Spraying

Mechanical Control
Bakers Hold Campground <1 Acre Grubbing Spotted Knapweed
Jump Center <1 Acre Grubbing Spotted Knapweed

Spurge Rate = 12%

Spotted Knapweed - 27%

County - 64.00/Acre heavy
59.50/Acre light

Kings Hill Ranger District Gallatin Jim Armstrong

Grubbing - $154/Acre If lots of rock.

Mowing - $60/Acre Roadside zones.

Patrol Costs $45/Acre

Control Costs $30/Acre

APPENDIX 7 - Available at Gallatin National Forest, Supervisor's Office only.

APPENDIX 8A

HUMAN HEALTH RISK ANALYSIS
FOR PROPOSED HERBICIDE SPRAY PROGRAMS TO CONTROL NOXIOUS WEEDS
ON THE GALLATIN NATIONAL FOREST

This appendix analyzes the risk to human health as a result of herbicide spray programs to control noxious weeds on the Gallatin National Forest. The integrated pest management alternative includes herbicide applications of 2,4-D and picloram (Tordon, tradename) onto approximately 260 acres of rangeland, road right-of-way (ROW), riparian habitat, and potentially occupied sites such as administrative sites and campgrounds. These 260 acres of spray area are scattered across approximately 1.7 million acres of the Gallatin National Forest.

Appendices 3, 4, and 5 classify the projects proposed under each alternative by location type. In the tables in these appendices the abbreviation ROW indicates that spraying occurs near a road right-of-way. RIP indicates that spraying occurs near riparian habitat (streams, lakes, etc.). OR indicates the spraying occurs on general open range or forest lands. OCC indicates spraying occurs on a potentially occupied site such as a campground or administrative site.

Analyses of human health impacts are provided for the worst-case example of each type of project. These worst-case examples are defined on the basis of proximity to water and residents, size of the spray area, and the amount of herbicide sprayed.

Worst-case Open Range/Riparian Project

Exposure Analysis

In terms of amount of herbicide applied, the worst-case open range project is the Deer Creek project on the Big Timber Ranger District. This project involves spraying more than 58.5 pounds of picloram active ingredient (a.i.) on 39 net acres and 8 pounds (a.i.) of 2,4-D onto 4 acres to control noxious weeds. These 43 total acres of noxious weeds are actually isolated infestations of 10 acres or less spread over approximately 2,500 acres of ground. The nearest residence is further than 1 mile from an area being sprayed although the analysis below assumes that a residence is within 200 meters (one-eighth mile) of this project. No spraying occurs on any open range closer than three-quarter mile to a residence. There are several small creeks in the area with flow rates ranging from 0.5 to 3.5 cubic feet per second.

The analysis of the Deer Creek project will be based on the analysis of the potential impacts of a 500-acre project involving the application of 150 pounds of picloram (including mixing and formulation errors) in combination with 2,4-D. Since very little 2,4-D is being sprayed, 2.4-D impacts are based on the analysis of a 20-acre project involving the application of 48 pounds of 2,4-D. The development of the 500-acre and 20-acre project analyses is contained in a document entitled "Analysis of Human Health Risks of the USDA Forest Service Use of Herbicides to Control Noxious Weeds in Region 1" (referred to below as the Background Document). This document is included as Appendix 8B of this Environmental Impact Statement.

The analysis of the model projects contained in the Background Document assumed that the spray site is continuous (i.e., not spread over a wide area) thus maximizing drift to adjacent areas. A residence is assumed to be located within 200 meters (220 yds) of the border of the nearest spray area. The residence is assumed to be downwind of the spray site and the residents are assumed to be outside and exposed to drift during the entire spray period. The residents are assumed to have a vegetable garden located adjacent to the house. In addition, the residents are assumed to consume a steer which has grazed exclusively on herbicide-treated grass and accumulated the maximum body burden of the herbicide. Residents or visitors are assumed to drink water and consume fish from a stream containing herbicide runoff.

Based on all critical exposure parameters, the actual Deer Creek project will provide less exposure to members of the general population than that calculated for the applicable open-range projects in the Background Document. Less herbicide would be applied in the Deer Creek project than is assumed in the large model project analyzed in the Background Document. The herbicide is applied over a large area thus concentrated drift will not occur. The nearest residence to the Deer Creek project is further than 1 mile from the spray area. However, the doses to these residents near the Deer Creek project are based on the assumption that the residences, gardens, and residents are only 220 yards from the spray site.

In addition to resident dose values, dose values are also provided for visitors who enter the area after spraying is completed and visitors who enter the spray area and consume 0.5 pound of vegetation that has been directly sprayed with picloram or 2,4-D. The Background Document in Appendix 8B provides all assumptions and calculations used to derive the potential doses to visitors and residents.

Table 1 provides dose values for members of the general population for the various exposure pathways of concern. Table 1 is derived in part from the Background Document's Table 2.17 (2,4-D doses) and Table 2.27 (picloram doses). In addition, the doses resulting from water contamination are based on information presented in Section 2.4.6.4 of the Background Document. The doses presented on Table 1 for fish and water consumption assume that 2 percent of the 22 pounds of picloram and 4 pounds of 2,4-D sprayed near Corker Canyon (0.5 cfs stream) is washed into the stream in a 24-hour period. The stream is also assumed to be a productive fishery.

As indicated on Table 1, the highest doses are dietary in origin. All of these doses are highly improbable. For example, the highly scattered nature of the spray sites (43 acres in 2,500 acres) insures that herbicide-treated vegetation will constitute a smaller portion of the diet of cattle than assumed in the Background Document. In addition, cattle apparently have a taste aversion to 2,4-D/picloram and refuse to graze on leafy spurge, sprayed or otherwise. Thus, the probable dose to human consumers would be much less than calculated here and probably nondetectable.

Table 1.--Worst-case dose levels to visitors and residents in the vicinity of a large, open-range project sprayed with a 2,4-D/picloram mixture.

	2,4-D dose (milligram of herbicide per kilogram of body weight per day)	Picloram dose (milligram of herbicide per kilogram of body weight per day)
Adult direct dose from drift	0.00008	0.000003
Adolescent direct dose from drift	0.00010	0.000004
Infant direct dose from drift	0.00020	0.000007
Adult/adolescent oral dose from consuming beef cattle dosed with herbicide	0.00071	0.00071
Infant oral dose from consuming beef cattle dosed with herbicide	0.00083	0.00083
Adult/adolescent oral dose from consuming vegetables from a garden impacted by drift	0.0031	0.0012
Infant oral dose from consuming vegetables from a garden impacted by drift	0.0038	0.0016
Adult oral dose (water)	0.0008	0.0046
Adolescent oral dose (water)	0.0011	0.0061
Infant oral dose (water)	0.0012	0.0067
Adult-adolescent oral dose (fish)	0.0002	0.0011
Infant oral dose (fish)	0.0003	0.0017
Visitor re-entry to spray site	0.0005	0.00011
Oral dose from consumption of sprayed wild food	0.056	0.007

The probability of human consumption of sprayed wild vegetation is also very small. The isolated nature of spray sites, the absence of wild foods in leafy spurge infestations, and the small percentage of the area being sprayed would make doses at this level very unlikely. In addition, in concentrations above 5 parts per million (ppm) on food, picloram and 2,4-D impart a very bitter taste to food thus limiting palatibility.

The oral doses from eating vegetables from a garden impacted with drift are also overestimates because the garden is assumed to be within 220 yards of a 500-acre spray area. The nearest garden to the Deer Creek project is over 1 mile away and there are no gardens within three-quarters of a mile of any smaller open-range projects. Thus, probable doses are hundreds to thousands of times smaller than indicated here.

Health Implications of Doses: Threshold Effects

Having defined the extreme outermost limits of doses that could be anticipated under any circumstances associated with the open-range spraying of noxious weeds, the significance of these doses must be determined. At some dose level all chemicals will have adverse effects. For some health effects of herbicides such as general toxic effects on kidney or liver function or reproductive effects on pregnant females, a dose level can be defined below which these effects would not occur. This level is often defined as the no-observed-effect level (NOEL).

For ethical reasons, testing of chemicals to define NOEL's is not performed on humans but rather on animal surrogates. The problem of extrapolating results from animals to humans has provoked much debate. The procedure adopted by most regulatory or advisory agencies, such as the U.S. Environmental Protection Agency (EPA), the Food and Drug Administration (FDA), and the World Health Organization (WHO), is to divide the NOEL (derived from the test animal that is most sensitive to the chemical) by a safety factor. The safety factor is designed to account for possible differences between humans and animals and also to account for the fact that some humans are more sensitive to chemicals.

The EPA has determined Acceptable Daily Intake (ADI) levels for both 2,4-D and picloram. The ADI is defined by EPA as the dose that could be taken everyday for a lifetime without adverse effects. As discussed in Section 2.5 of the Background Document, the ADI for 2,4-D was defined by EPA by dividing the NOEL of 1.0 mg/kg/day by a safety factor of 100 (ADI = 0.01 mg/kg/day). The picloram ADI was defined by dividing the NOEL of 50 mg/kg/day by a safety factor of 2,000 (ADI = 0.0250 mg/kg/day). A smaller safety factor for 2,4-D was used because more long-term testing is available with the compound.

The extreme dose estimates for the Deer Creek project can be compared to the ADI's. This comparison makes the further conservative assumption that a maximum-exposed resident is directly exposed to drift and than eats from a contaminated vegetable garden and consumes contaminated beef on the same day. Table 2 provides ADI comparisons which are developed by dividing the ADI by the dose. If the dose is less than the ADI, the resulting number will be greater than one. The larger the number, the greater the "margin of safety".

As shown on Table 2, with but one exception, all combinations of dose are below the ADI. The only way a person could get a dose above the ADI for 2,4-D, would be to visit a spray site and then eat one-half pound of vegetation that has been directly sprayed. This is highly unlikely since these leafy-spurge infested range sites do not contain vegetation considered edible by humans.

Table 2.--ADI dose comparison for maximum-exposed residents and visitors in the vicinity of a large, open-range project sprayed with 2,4-D/picloram.

	2,4-D	Picloram
Adult resident	2.6	13
Adolescent resident	2.6	13
Infant resident	2.1	10
Visitor re-entry	2.0	23
Visitor re-entry with consumption of sprayed wild food	Above	3.6

Were the assumptions of this "wild-food consumption" scenario met, the dose would still be about one-half the 2,4-D NOEL as determined in long-term feeding studies with rats. At dose levels above 1.0 mg/kg/day, minor effects on kidney function were noted. Since 2,4-D breaks down quickly on vegetation (half would typically disappear in less than a week), the chance for long-term exposure is again minimal.

The highest possible 2,4-D or picloram doses are also more than 1,000 times lower than the doses that affect fetuses in the most sensitive animal species tested.

Cancer and Mutations

Some potential effects of chemical exposure are not reversible once initiated. These effects include cancer and mutations that might be passed on from one generation to another. This analysis assumes that 2,4-D and picloram can cause cancer and that every additional dose of 2,4-D and picloram increases one's probability of developing cancer. In other words, this analysis assumes that from the perspective of cancerous effects, there is no such thing as an absolutely safe dose of a carcinogen (cancer-causing chemical).

Section 2.7 of the Background Document discusses the very conservative model that is used to predict the probability of cancer from various doses. Table 3 provides cancer probabilities for various exposure pathways for the Deer Creek Project. This table is derived from Tables 2.83 and 2.92 of the Background Document. As discussed in Section 2.7.8 of the Background Document, these cancer probabilities assume long-term exposure to 2,4-D and picloram. For example, the residents were assumed to eat contaminated beef for for 140 days and contaminated garden vegetables for 42 days.

Table 3.--Cancer probabilities for visitors and residents in the vicinity of a large, open-range project sprayed with a 2,4-D/picloram mixture.

	Probability from 2,4-D dose	Probability from picloram dose
Adult dermal dose	3.2×10^{-11}	2.0×10^{-13}
Adolescent dermal dose	4.3×10^{-11}	2.7×10^{-13}
Infant dermal dose	8.0×10^{-11}	4.7×10^{-13}
Adult/adolescent oral dose (beef)	2.0×10^{-8}	2.2×10^{-9}
Infant oral dose (beef)	2.3×10^{-8}	2.6×10^{-9}
Adult/adolescent oral dose (veg)	1.5×10^{-8}	6.5×10^{-10}
Infant oral dose (veg)	1.8×10^{-8}	8.7×10^{-10}
Adult oral dose (water)	1.6×10^{-10}	1.0×10^{-10}
Adolescent oral dose (water)	2.2×10^{-10}	1.4×10^{-10}
Infant oral dose (water)	2.4×10^{-10}	1.5×10^{-10}
Adult/adolescent oral dose fish	3.9×10^{-11}	2.5×10^{-11}
Infant oral dose (fish)	5.9×10^{-11}	3.8×10^{-11}
Visitor re-entry to spray site 1 day	1.0×10^{-10}	2.4×10^{-12}
Oral dose/sprayed wild food 1 day	1.1×10^{-8}	1.6×10^{-10}

For maximum-exposed residents, the cancer probabilities from various exposure pathways can be added together. For example, the cancer probability for an infant exposed to drift, contaminated beef and garden vegetables would be 4.455 x 10^{-8} ($8.0 \times 10^{-11} + 2.3 \times 10^{-8} + 1.8 \times 10^{-8} + 4.7 \times 10^{-13} + 2.6 \times 10^{-9} + 8.7 \times 10^{-10}$). In other words, the infant has about five chances in 100 million of developing cancer from the cumulative impacts of all doses of 2,4-D and picloram. If, for 5 consecutive years, the Forest Service were to treat this project and an infant were to get all worst-case doses, his cancer probability would be 2.2 x 10^{-7} ($5 \times 4.455 \times 10^{-8}$) or about two chances in 10 million.

The assessed risk of cancer that could occur from using 2,4-D and picloram to control noxious weeds is only meaningful to the decisionmaker or other readers if it can be compared to similarly determined risks for known cancer-causing agents (such as x-rays or smoking) or other risks of death. Some risks are so small that people tend to ignore them because they are unconsciously accepted (e.g., crossing a street). For example, many risks of 10^{-6} per year (one chance in a million) are familiar and casually accepted by the general public.

Weighted lifetime risks of cancer to an individual exposed to 2,4-D and picloram can be compared to a number of risks familiar to society as listed in Table 4 (taken from Table 2.98 of the Background Document). The cancer risks shown in Table 4 were calculated by a method similar to that used in this analysis; so the same uncertainties with exposure, measurements of potency, and extrapolation between laboratory animals and humans apply. In all cases, the lifetime risk of cancer resulting from exposure to 2,4-D and picloram is lower than the risk of cancer from smoking two cigarettes, drinking 40 diet sodas, or having a single x-ray in a lifetime, which are all in the order of 10^{-6} or one-in-a-million risk. Cancer risk in the use of 2,4-D and picloram is obviously a major concern; although the project decisionmaker must establish a frame of reference in evaluating the magnitude of this risk.

Based on data discussed in Section 2.7 of the Background Document, neither 2,4-D or picloram involve significant mutagenic potential. Since mutagenicity and carcinogenicity both follow similar mechanistic steps (at least those that involve genetic toxicity), the increased risk of cancer can be used to approximate the quantitative risk of heritable mutations (birth defects). The basis for this assumption is that both mutagenicity and at least primary carcinogens react with DNA to form a mutation, or DNA lesion, affecting a particular gene or set of genes. The genetic lesions then require specific metabolic processes to occur or the cells must divide the lesion into the genetic code of the cell. We believe the cancer risk provides a worst-case approximation to heritable mutations because cancer involves many types of cells whereas heritable mutations involve only germinal (reproductive) cells. Therefore, the worst-case risk of heritable mutations is less than one chance in 10 million.

Table 4.--Lifetime risk of death or cancer resulting from everyday activities (from Crouch and Wilson (1982)).

Activity	Time to accumulate a one-in-a-million risk of death	Average annual risk per capita
Living in the United States		
Motor vehicle accident	1.5 days	2×10^{-4}
Falls	6 days	6×10^{-5}
Drowning	10 days	4×10^{-5}
Fires	13 days	3×10^{-5}
Firearms	36 days	1×10^{-5}
Electrocution	2 months	5×10^{-6}
Tornados	20 months	6×10^{-7}
Floods	20 months	6×10^{-7}
Lightning	2 years	5×10^{-7}
Animal bite or sting	4 years	2×10^{-7}
Occupational Risks		
General		
manufacturing	4.5 days	8×10^{-5}
trade	7 days	5×10^{-3}
service & government	3.5 days	1×10^{-4}
transport & public utilities	1 day	4×10^{-4}
agriculture	15 hours	6×10^{-4}
construction	14 hours	6×10^{-4}
mining and quarrying	9 hours	1×10^{-3}
Specific		
coal mining (accidents)	14 hours	6×10^{-4}
police duty	1.5 days	2×10^{-4}
railroad employment	1.5 days	2×10^{-4}
fire fighting	11 hours	8×10^{-4}

Source of risk	One-In-A-Million Risks of Cancer Type and amount of exposure; examples
Cosmic rays	One transcontinental round trip by air; living 1.5 months in Colorado compared to New York; camping at 15,000 feet over 6 days compared to sea level.
Other	20 days of sea level natural background radiation; 2.5 months in masonry rather than wood building; 1/7 of a chest x-ray using modern equipment.
Eating & drinking	40 diet sodas (saccharin) 6 pounds of peanut butter (aflatoxin) 180 pints of milk (aflatoxin) 200 gallons of drinking water from Miami or New Orleans 90 pounds of broiled steak (cancer risk only)
Smoking	2 cigarettes

Impacts on Workers from Open-Range Spraying

Herbicide application on a project the size of Deer Creek will require four workers about 10 days each to complete using backpack sprayers and truck-mounted tanks with hand sprayer attachments. Each applicator would either apply about 2.0 pounds (0.9 kilograms) of 2,4-D or 1.5 pounds (0.7 kilograms) of picloram per day.

Worker-dose data is not available for conditions typifying the spraying of noxious weeds. The Background Document extrapolates from data on workers spraying brushfields 5 to 15 feet high with backpack sprayers. Because of the excessive dermal exposure resulting from full body contact with wet vegetation as well as the spray fallout involved in spraying over one's head, this data overestimates dose from spraying noxious weeds that are less than 3 feet high. In addition, these workers in the forestry study wore little protective clothing, often only short-sleeved or sleveless shirts and no gloves. Dose estimates for backpack sprayers based on this forestry study would range from 0.09 mg/kg/day to worst-case values of 0.21 mg/kg/day for 2,4-D ((0.9 kg x 0.234 mg/kg/kg/) (see Sections 2.4.1 and 2.6.2 of the Background Document).

As discussed in the Background Document (Section 2.4.1), less data is available for workers applying picloram with backpack sprayers. As noted in the Background Document, dermal absorption for 2,4-D is higher than picloram (6 percent versus less than 1 percent). When 2,4-D and picloram are applied together, the picloram doses are generally one-third to one-tenth the 2,4-D dose when differences in application amount are allowed for. Assuming as an extreme that picloram dose rates (weighted for application amount) are the same as 2,4-D, the worst-case picloram dose would be 0.16 mg/kg/day (0.7 kg x 0.234 mg/kg/day). An assumption that the picloram dose is one-fifth of the 2,4-D dose (weighted for application amount), would give a more realistic dose estimate of 0.03 mg/kg/day (0.16 mg/kg/day x 0.2).

As noted above, calculated doses include the implicit assumption that workers work with bare hands and wear ordinary work clothing such as cotton pants and short-sleeved shirts. It is common practice; however, for herbicide applicators to wear clothing that affords more protection. Typical clothing often includes long-sleeved shirts and coveralls, gloves and hats.

Research reviewed since the completion of the Background Document has shown that such protective clothing can reduce worker exposure by 27 to 99 percent. For example, in right-of-way spraying, doses of spray gun applicators wearing clean coveralls and gloves were reduced by 68 percent compared to the doses they got without this protection (Libich et al. 1984).

During insecticide applications to orchards, mixers reduced their exposure by 35 percent and sprayers reduced their exposure by 49 percent by wearing coveralls (Davies et al. 1982). Putnam and coworkers found that nitrofen applicators and mixer/loaders wearing protective clothing reduced their exposure by 94 to 99 percent compared to the doses experienced without

protection (Waldron 1985). Although protective clothing generally does reduce worker exposure and resulting doses, the degree of protection depends on the application system, the work practices, and the specific herbicide. In the forestry application study used as a basis for backpack sprayer doses, workers wearing more clothing did not receive significantly lower doses than workers with less clothing. In this case, backpack applicators had to treat and move through dense vegetation that was taller than themselves.

Under the less rigorous conditions of noxious weed spraying, additional protective clothing is assumed to reduce backpack worker dose by 68 percent. Table 5 summarizes worker doses (backpack and hand-gun sprayers) based on various assumptions outlined above.

Table 6 compares the worker dose estimates to the 2,4-D or picloram NOEL derived from the most sensitive animal species tested with these herbicides. Dose levels are not compared to the ADI values because all but one dose estimate are above the ADI values.

Table 5.--Worker dose estimates for open-range application (Deer Creek Project).

	Worst case dose (low protection) (mg/kg/day)	Worst case dose (normal protection) (mg/kg/day)	Average dose (low protection) (mg/kg/day)	Average dose (normal protection) (mg/kg/day)
2,4-D	0.21	0.07	0.09	0.03
Picloram	0.16	0.05	0.03	0.01

Table 6.--NOEL/dose comparisons for worker doses.

	Worst case dose (low protection) (mg/kg/day)	Worst case dose (normal protection) (mg/kg/day)	Average dose (low protection) (mg/kg/day)	Average dose (normal protection) (mg/kg/day)
2,4-D	4.8	14	11	33
Picloram	44	140	233*	700*

*Dose is below the ADI for picloram.

All picloram dose estimates indicate sufficient margins of safety to protect worker health particularly if attention is paid to protective clothing and careful application techniques. The potential worker doses from 2,4-D applications have much lower margins of safety. Effects on kidney function are possible, particularly if workers use sloppy application techniques and little protective clothing.

Workers must be explicitly advised of the possible effects of 2,4-D application and the necessity of careful techniques and protective clothing. The relatively short period of application (3 weeks or less) and careful application technique will minimize or eliminate health effects.

The worker cancer probabilities can be calculated for various dose estimates. Assuming that a worker applies herbicide for 15 days a year for 5 years, the worker cancer probability for 2,4-D would range from about four chances in 10 million to four chances in one million depending on dose estimates used. Equivalent probabilities for picloram would range from three chances in 100 million to 1.5 chances in 10 million. As might be expected, these probabilities are above those of the general public. However, they are still within a range apparently accepted by society.

Worst-case Right-of-Way Project

Noxious weeds often spread initially along transportation corridors. As a consequence, the Forest Service contemplates spraying along roads.

As indicated in Appendix 5 all ROW projects contemplated on the Gallatin NF involve small amounts of herbicide (50 pounds or less) on scattered infestations. The largest ROW project on the Gallatin National Forest is the Smith Creek project on the Livingston Ranger District. This project involves application of about 41 pounds (a.i.) of 2,4-D and 5 pounds of picloram on scattered infestations along about 15 miles of road (30 miles of roadside).

The Background Document analyzes impacts of several different herbicides and application amount on ROW projects. Exposure and dosage values for 2,4-D application on the the Smith Creek project are based on a model ROW project involving application of 48 pounds of 2,4-D. Picloram values are based on dose estimates for a model project involving application of picloram (6 pounds a.i.) in combination with 2,4-D.

Since the projects contemplated here would involve less pesticide which would be applied over a larger area, the worst-case risk factors developed for the generic projects will be used to estimate the actual risk levels.

The worst-case estimates of dose levels have been developed for residents within 60 meters (200 feet) who are exposed directly to drift and who eat garden vegetables contaminated with drift. The dose to an adolescent who might walk within 1 yard of a spray rig during application and the dose to a person who re-enters the spray area after spraying has occurred is also calculated.

Because many roads are located in valley bottoms, impacts on water sources are possible. The Background Document assumes a stream flowing at 1 cubic foot of water per second. This flow rate is similar to flow rates of smaller streams in the vicinity of ROW projects on the Gallatin NF. For example, Smith Creek has a flow rate of 12 cfs and Stag Creek, a tributary of Smith Creek near the project, has a flow rate of 1 cfs.

Table 7 summarizes worst-case doses for right-of-way projects as derived from Section 2.4.6 of the Background Document (Tables 2.32 and 2.33).

Table 7.--Worst-case daily dose to residents in the vicinity of right-of-way projects sprayed with mixtures of 2,4-D/picloram.

	2,4-D (mg/kg/day)	Picloram (mg/kg/day)
Adult dermal dose	0.00004	0.0000005
Adolescent dermal dose	0.038	0.0005
Infant dermal dose	0.000096	0.0000012
Adult/adolescent oral dose (beef)	0.0000071	0.0000071
Infant oral dose (beef)	0.0000083	0.0000083
Adult/adolescent oral dose (veg)	0.0010	0.00013
Infant oral dose (veg)	0.0013	0.00015
Visitor re-entry or walk along ROW	0.0018	0.00023
Adult oral dose (water)	0.0058	0.00072
Adolescent oral dose (water)	0.0076	0.001
Infant oral dose (water)	0.0083	0.0011
Adult/adolescent oral dose (fish)	0.00010	0.000017
Infant oral dose (fish)	0.00011	0.000019

Table 8 provides ADI/dose comparisons for various maximum-exposed individuals who are assumed to receive a combination of doses.

Table 8.--ADI/dose comparisons for maximum-exposed residents and visitors in the vicinity of right-of-way projects sprayed with 2,4-D/picloram mixtures.

	2,4-D	Picloram
Adult resident	1.4	29
Adolescent resident (dermal and oral dose)	Above	15
Adolescent resident (oral doses only)	1.1	22
Infant resident	1.0	21
Visitor re-entry	5.7	109

The only dose that might exceed the ADI would occur if a person "tagged" along with the spray crew applying 2,4-D. As discussed in Section 2.4.6.2 of the Background Document, the method of calculating this dose was extremely conservative and this dose would likely never occur. If this dose did occur, it would be less than the 2,4-D NOEL (based on long-term animal exposure tests) by a factor of 21. Since this dose would occur only for a day, health would not be affected.

Cancer probabilities for all potentially exposed individuals would be well below those calculated for open-range projects (see Section 2.7.8 of the Background Document).

Right-of-way projects would involve herbicide application from a truck with less potential exposure to workers. Thus, worker dose and risk would be less than that calculated for open-range projects.

Potentially Occupied Sites

Application of small quantities of 2,4-D or picloram is proposed in several campgrounds and administrative sites. Two exposure pathways of concern are dermal contact with sprayed vegetation and soil, and the consumption of sprayed wild food.

All camp sites will be closed and posted during spraying and for 2 days after spraying. In addition, at least half of he 2,4-D herbicide can be expected to disappear from the campground in 2 weeks because of the herbicide's low persistence in the environment. Thus, doses to persons re-entering the sites will be lower than the visitor doses calculated for open-range projects. As discussed in the Background Document (Section 2.4.3.4), the removal of herbicides from sprayed surfaces is very difficult within a short time after spraying.

Any wild foods sources such as berry bushes would still be in blossom or in early reproductive stages when spraying occurs. Thus, consumption of wild food would not be possible. If bushes were accidentally sprayed the herbicidal action on these bushes would prevent fruit development. Thus, doses to a person consuming any wild foods would be less than that calculated for open-range projects.

Dose to workers would also be less than open-range calculations because very little herbicide is applied per day (less than 2 pounds of active ingredient).

Major Accidents

The effect of a major truck spill of 300 gallons of herbicide mix containing 22 pounds active ingredient of herbicide into various drinking water reservoirs is discussed in Section 3 of the Background document. The spray programs in the Gallatin NF will involve spraying near drinking water sources for the town of Bozeman. The worst-case spill scenarios in the Background Document indicate the effect of a major spills into streams feeding reservoirs typical of those in the Gallatin National Forest area. Assuming only dilution, the highest herbicide dose to an adult drinking 2 liters of this water would be 0.014 mg/kg. This dose slightly exceeds the ADI for 2,4-D and is less than the ADI for picloram. Doses at this level would occur only for a day since concentrations in water would be quickly diluted. Long-term health impacts are not expected.

Section 3.2.1 of the Background Document discusses the probability of various types of truck accidents. Based on these calculations and on assumption of 5,000 miles of pesticide truck travel per year, a truck accident resulting in spill of pesticides would occur less than once every thousand years on the Gallatin National Forest. Spills into water would occur less frequently.

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Specimen Label

RESTRICTED USE PESTICIDE

For retail sale to and use only by Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification.

Tordon* 22K
Weed Killer

Active Ingredient(s):
Picloram (4-amino-3,5,6-trichloropicolinic acid), as the potassium salt 24.4%
Inert Ingredients 75.6%
Acid Equivalent:
Picloram (4-amino-3,5,6-trichloropicolinic acid) - 21.1% - 2 lb/gal
E.P.A. Registration No. 464-323
E.P.A. Est. 464-MI-1

KEEP OUT OF REACH OF CHILDREN

CAUTION

AVISO:

PRECAUCION AL USUARIO:
Si usted no lee inglés, no use este producto hasta que la etiqueta le haya sido explicada ampliamente.

PRECAUTIONARY STATEMENTS

Hazards to Humans and Domestic Animals

MAY CAUSE IRRITATION

Avoid Contact With Skin And Eyes • Avoid Breathing Spray Mist • Keep Container Closed

STATEMENTS OF PRACTICAL TREATMENT In **case** of contact, immediately flush eyes or skin with plenty of water. Get medical attention if irritation persists. If **swallowed**, induce vomiting immediately by giving two glasses of water and sticking finger down throat. Call a physician. Do not induce vomiting or give anything by mouth to an unconscious person.

Physical or Chemical Hazards

Do Not Cut or Weld Container.

Environmental Hazards

Do not apply directly to water. • Do not apply where runoff is likely to occur. • Do not contaminate water by cleaning of equipment or disposal of wastes. • Do not contaminate irrigation ditches or water used for irrigation or domestic purposes.

NOTICE
Read the entire label. Use only according to label directions.
Before buying or using this product, read "WARRANTY LIMITATIONS AND DISCLAIMER" elsewhere on this label. If terms are not acceptable, return **unopened** package at once to seller for full refund of purchase price paid. Otherwise, use by the buyer or any other user constitutes acceptance of the terms under the Limit of Warranty and Liability.

IN CASE OF AN EMERGENCY
endangering life or property involving this product, call collect 517-636-4400

AGRICULTURAL CHEMICAL

Do Not Ship or Store with Food, Feeds, Drugs, or Clothing

READ THE FEDERAL LABEL AND APPROPRIATE STATE LABELS BEFORE USING THIS PRODUCT

Tordon* 22K

CONTENTS ..... PAGE NO.

FEDERAL (E.P.A.) LABEL

GENERAL INFORMATION

Use TORDON 22K Weed Killer on non-cropland areas such as fence rows, around farm buildings, equipment pathways and roadsides, to control annual and deep rooted perennial weeds such as Absynth wormwood - Bracken-fern - Buffalo bur - Bur ragweed - Burroweed - Cactus species - Camel thorn - Catclaw acacia - Chaparral species Dock - Firebrush - Field bindweed (perennial morning-glory) - Fringed sagebrush - Gambel oak - Goldenrod - Gorse - Guava - Hau - Horsenettles, Carolina, white - Java plum - Junipers - Knapweeds, diffuse, Russian, spotted squarrose - Lantana - Larkspurs - Leafy spurge - Live oak - Locoweeds - Lupines - Melastoma - Mesquite - Ox-eye daisy - Milkweed - Pamakani - Poison Oak - Pinyon - Pricklypear cactus - Rabbitbrush - Rush skeletonweed - Scotch broom - Snakeweeds - Sowthistle - Starthistles, Iberian, purple, yellow - Tansy ragwort - Toadflaxes - Thistles, artichoke, Beaumont, Canada, distaff, golden, italian, musk, scotch, wavy leaf.

Picloram is highly potent, persistent and water soluble. Tiny amounts can kill or injure many broadleafed plants. To prevent damage to desirable crops and plants **follow all directions and precautions.**

DIRECTIONS FOR USE

Do not use for manufacturing or formulating.

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Mix the required amount of TORDON 22K Weed Killer in water and apply as a coarse low pressure spray using ground equipment or aircraft. For best results treat when the weeds are growing actively in the spring before full bloom or late summer into fall. Treatments during full bloom or seed stage of some weeds may not give good control.

For General Use on Perennial Weeds on Non-Cropland, use 1 to 1-1/2 gallons of TORDON 22K Weed Killer per acre in 50 to 100 gallons of water and spray to wet weed foliage and soil. **NOTE:** Local conditions may affect the use of herbicides. State agricultural experiment stations or extension service weed specialists in many states issue recommendations to fit local conditions. Be sure that use of this product conforms to all applicable regulations.

For Use As A Spot Treatment on Perennial Weeds. Mix at the rate of 1 gallon of TORDON 22K per 100 gallons of water. Apply at the rate of 100 gallons of spray mixture per acre. This will provide a rate of 2 pounds of picloram per acre. For small amounts use 2-1/2 fluid ounces TORDON 22K per 2 gallons of water. For round patches apply as indicated in the lable.

Feet across Round Patch to be treated (weed area plus 10 foot border)	Gallons of spray mixture to apply
25	1.0
50	4.5
75	10.0
100	18.0
235 or (1 acre)	100.0

Tank Mixture for Spot or Broadcast Treatment of Susceptible Annual and Perennial Broadleaf Weeds: TORDON 22K may also be tank mixed with 2,4-D products such as ESTERON® 99® Concentrate, FORMULA 40®, DMA® 4, or ESTERON 6E herbicides for use on areas having mixed species including those which respond well to 2,4-D. Read and follow all directions and use precautions on other product labels.

Be Sure You Follow All Use Precautions Given on This Label and Remember These Key Points

1. Use only the recommended amounts.
2. Picloram is persistent. It will carry over in the soil.
3. TORDON 22K is water soluble. It can move with water in irrigation or drainage ditches.
4. Spray drift can damage crops.

USE PRECAUTIONS

Use this product only as specified on this label. Observe any special use and application restrictions and limitations, including method of application and permissible areas of use as promulgated by state or local authorities.

Do Not Apply or Otherwise Permit TORDON 22K or Sprays Containing TORDON 22K to Contact Crops or Other Desirable Broadleaf Plants including but not limited to alfalfa, beans, grapes, melons, peas, potatoes, safflower, soybeans, sugarbeets, sunflower, tomatoes, and other vegetable crops, flowers, fruit plants, ornamentals, shade trees nor the soil containing roots of nearby valuable plants.

Avoid Injurious Spray Drift: Applications should be made only when there is no hazard from spray drift since very small quantities of the spray, which may not be visible, may severely injure susceptible crops during both growing and dormant periods. To minimize spray drift use low spray pressure, under 30 psi; spray when wind velocity is less than 10 mph; and apply as a coarse spray. To aid in further reducing spray drift, a drift control and deposition aid such as NALCO-TROL(1) may be used with this product. If such a drift control aid is used, follow all use recommendations and precautions on the product label.

(1) NALCO-TROL - Trademark of NALCO Chemical Company.

Ground Equipment: With ground equipment spray drift can be lessened by keeping the spray boom as low as possible; by applying 20 gallons or more of spray per acre; by using no more than 30 pounds spraying pressure with large droplet producing nozzle tips; by spraying when wind velocity is low; and by stopping all spraying when wind exceeds 10 miles per hour. Do not apply with hollow cone-type insecticide or other nozzles that produce fine-droplet spray.

Aerial Application: With aircraft, drift can be lessened by using straight stream nozzles directed straight back, and by using a spray boom no longer than 3/4 the wing span of the aircraft.

Determine Air Movement and Direction Before Foliar Application: Do not spray when wind is blowing toward

susceptible crops or ornamental plants near enough to be injured. It is suggested that a continuous smoke column at or near the spray site or a smoke generator on the spray equipment be used to detect air movements, lapse conditions, or temperature inversions (stable air). If the smoke layers or indicates a potential of hazardous spray drift, do not spray.

Do Not Contaminate Water Intended for Irrigation or Domestic Purposes. To avoid injury to crops or other desirable plants do not treat or allow spray drift to fall onto innerbanks or bottom of irrigation ditches or other channels that carry water that may be used for irrigation purposes.

Do Not Move Treated Soil To Other Areas. Do not use it to grow plants, unless adequately sensitive bioassay or chemical tests show that no detectable picloram is present in the soil.

Do Not Mix with Dry Fertilizer.

STORAGE AND DISPOSAL

Prohibitions: Do not contaminate water, food, or feed by storage or disposal. Open dumping is prohibited.

Pesticide Disposal: Pesticide, spray, mixture, or rinsate that cannot be used or chemically reprocessed should be disposed of in a landfill approved for pesticides or buried in a safe place away from water supplies.

Container Disposal: Do not re-use containers for TORDON 22K herbicide for any purpose. Dispose by punching holes in them and burying with waste or by taking to an approved landfill. Where indicated, follow official local container disposal regulations. Plastic containers may also be disposed of by incineration or, if allowed by state and local authorities, by burning. If burned, stay out of smoke.

Rinse application equipment after use, at least three times with water, and dispose of rinse water in a non-cropland area away from water supplies.

General: Consult federal, state or local disposal authorities for approved alternative procedures.

SPECIAL LOCAL NEEDS

MONTANA ..... EPA SLN NO. MT-780003

For the Control of Broadleaf Weeds in Rangelands, Permanent Grass Pastures, Spring Barley and Oats, and Spring and Winter Wheat.

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

Read complete use directions and precautions on this label and container label before using.

Rangeland and Pasture

Use TORDON 22K Weed Killer to control broadleaf annual and perennial weeds such as Canadian and other thistles, field bindweed, leafy spurge, Russian knapweed, spotted knapweed, tall larkspur, yellow toadflax, locoweed, snakeweed and lupinas on rangeland and permanent grass pastures. Treat when weeds are growing well using low pressure sprays. Retreatment at the same rate may be necessary the following year.

Spot Treatment: (ground application only) Use TORDON 22K at rates of 2 to 4 quarts in 20 to 100 gallons of water per acre and apply as a spray to the foliage. Use the higher rates to control leafy spurge, larkspur, toadflax and knapweed. Use the lower rates for bindweed and thistles. For a 1,000 square foot infestation, apply about 2-1/4 fluid ounces of TORDON 22K in 1 gallon of water (equivalent to 3 quarts per acre of TORDON 22K).

NOTE: When spot treating, do not cut grass for feed within 2 weeks after treatment. Meat animals grazing for up to 2 weeks after treatment should be removed from treated areas 3 days prior to slaughter. Do not graze dairy animals on treated areas within 2 weeks after treatment.

Broadcast Treatment: (ground or aerial application) to suppress the growth of many perennial broadleaf weeds, apply as a broadcast spray using 1 quart of TORDON 22K in 1 to 4 gallons of water per acre by air or in 20 to 100 gallons of water per acre by ground equipment and apply as a broadcast spray during the growing season when weeds are growing well. (Many seedling annual weeds can be controlled using 1 pint per acre.)

Tank Mixture for Spot or Broadcast Treatments: TORDON 22K may also be tank mixed with 2,4-D products such as ESTERON® 99® Concentrate, FORMULA 40®, DMA® 4 or ESTERON 6E herbicides for use on areas having mixed species including those which respond well to 2,4-D, such as big sagebrush. In tank mix combinations, use 1 pint to 1 quart of TORDON 22K with 1 to 2 quarts ESTERON 99 Concentrate, FORMULA 40 or DMA 4, or with 2/3 to 1-1/3 quarts of ESTERON 6E per acre, in spray volumes specified above. **Read and follow all directions and use precautions on other product labels.**

Spring Barley and Oats, Spring and Winter Wheat not Underseeded with a Legume

For the control of wild buckwheat and other annual broadleaf weeds normally controlled with 2,4-D or MCPA such as wild mustard, Russian thistle, pennycress, lambsquarters and pigweed, in spring wheat and barley and winter wheat, use TORDON 22K as a tank mix with a 2,4-D or MCPA formulation such as DMA 4, FORMULA 40, ESTERON 99 Concentrate, ESTERON 6E, or MCP Amine Herbicides. For use on spring oats, tank mix only with MCP Amine Herbicide. **Read and follow all directions and use precautions on other product labels.**

Spring Wheat, Barley and Oats: Apply during the 3 through 5 leaf stage of growth. Application of TORDON 22K occasionally causes slight head malformations and straw shortening but normally this does not affect yield.

Durum Wheat: Do not treat durum since at least some varieties appear to be more sensitive than other wheat.

Winter Wheat: Apply after resumption of active growth in the spring and before the early boot stage.

For aerial or ground treatment, use enough total spray volume to provide adequate spray coverage. Apply 1 to 4 gpa by air and 5 to 20 gpa by ground. Spray pressure should not exceed 30 psi. Use a coarse spray to minimize spray drift.

To prepare the spray, mix only with water. Add about half the desired amount of water in the spray tank. Then with agitation, add the recommended amount of TORDON 22K and 2,4-D or MCPA as outlined in the table. Finally, with continued agitation, add the rest of the water.

The dosages recommended equate to 1/4 oz. picloram + 4 oz. 2,4-D or MCPA ae/acre when weeds are small or 3/8 + 6 oz./acre when weeds are more advanced or when dry soil conditions exist.

Use Rates for Barley, Oats, and Wheat

Weed Growth Stage	Amounts of Each Product Per Acre †		
	TORDON 22K	plus DMA 4, FORMULA 40 ESTERON 99 Concentrate or MCP Amine	or ESTERON 6E
weeds 1-3 inches tall	1 fl. oz.	⅓ pt.	⅓ pt
weeds 3-6 inches tall or under dry conditions	1 ⅓ fl oz	⅔ pt.	½ pt

† When measuring small amounts of TORDON 22K weed killer, special care should be taken not to exceed suggested rates

NOTE: Use only on land that will be planted the following year to grass or grain crops such as small grains, corn, sorghum, or flax. Do not apply more than 3/8 ounce picloram per acre during any 12-month period.

USE PRECAUTIONS

Use this product only as specified on this label. Observe any special use and application restrictions and limitations, including method of application and permissible areas of use as promulgated by state or local authorities.

Do Not Contaminate Nontarget Land Areas, Cropland, Water, or Irrigation Ditches. Do not apply directly to standing or running water. Do not apply where surface water from treated areas can run off to adjacent cropland, either planted or to be planted, or into streams, irrigation

ditches, irrigation ponds, or wells. Do not clean containers nor application equipment on or near these areas. Do not apply on inner banks or bottom of irrigation ditches.

Do not apply on or in the vicinity of susceptible crops or desirable plants including alfalfa, beans, grapes, melons, peas, potatoes, safflower, soybeans, sugar beets, sunflower, tomatoes and other vegetable crops, flowers, fruit plants, ornamentals or shade trees.

Avoid Spray Drift: Applications should be made only when there is no hazard from spray drift since very small quantities of the spray, which may not be visible, may severely injure susceptible crops during both growing and dormant periods. Use coarse sprays to minimize drift since, under adverse weather conditions, fine spray droplets may drift a mile or more. The spray thickening agent, NALCO-TROL(1), may be used with this product to aid in reducing spray drift. If used follow all use recommendations and precautions on the product label.

(1) NALCO-TROL - Trademark of NALCO Chemical Company

Ground Equipment: With ground equipment, spray drift can be lessened by keeping the spray boom as low as possible; by applying 20 gallons or more of spray per acre; by using no more than 30 pounds spraying pressure with large droplet producing nozzle tips; by spraying when wind velocity is low; and by stopping all spraying when wind exceeds 10 miles per hour. Do not apply with hollow cone-type insecticide or other nozzles that produce a fine-droplet spray.

Aerial Application: With aircraft, drift can be lessened by applying a coarse spray; by using no more than 30 pounds spray pressure at nozzles; by using straight stream nozzles directed straight back, by using a spray boom no longer than 3/4 the wing span of the aircraft; and by spraying only when wind velocity is less than 10 mph.

Do Not Apply By Aircraft When An Air Temperature Inversion Exists: Such a condition is characterized by little or no wind and with air temperature lower near the ground than at higher levels. The use of a continuous smoke column at or near site of application or use of a smoke generating device on the aircraft is suggested to indicate direction and velocity of air movement, and to indicate a temperature inversion by layering of the smoke.

Do not rotate treated rangeland or pasture to other crop uses.

Do not spray pastures or grain if the forage legume component is desired. TORDON 22K Weed Killer may injure or kill legumes. Also new legume seedlings may not be successful if made within 2 years following application of this herbicide.

Do not move treated soil to other areas. Do not use it to grow plants, unless adequate sensitive bioassay or chemical tests show that no detectable picloram is present in the soil.

Do not transfer livestock from treated grass areas onto broadleaf crop areas without first allowing 7 days of grazing on untreated grass pasture. Otherwise, urine may contain enough picloram to cause injury to sensitive broadleaf plants.

Do not re-use containers for TORDON 22K Weed Killer for any purpose. Dispose by punching holes in them and burying with waste or by taking to an approved landfill. Where indicated, follow official local container disposal regulations.

Rinse application equipment after use, preferably at least three times with water, and dispose of rinse water in a non-cropland area away from water supplies.

Be sure that use of this product conforms to all applicable regulations.

Do not use where a sandy porous surface and subatrate overlie ground water 10 feet or less below the surface.

SPECIMEN LABEL 86-1754 DATE CODE A1184
REPLACES 86-1754 DATE CODE 784
DISCARD PREVIOUS SPECIMEN LABELS

REVISIONS INCLUDE:
1) REVISED FEDERAL EPA LABEL TO CLARIFY DIRECTIONS FOR USE AND USE PRECAUTIONS.
2) ADDED APPROPRIATE PLASTIC CONTAINER DISPOSAL PROCEDURE.

SL3080

Specimen Label

RESTRICTED USE PESTICIDE

For retail sale to and use only by Certified Applicators or persons under their direct supervision and only for those uses covered by the Certified Applicator's certification.

TORDON* 2K

Pellets Herbicide

Active Ingredient(s):
Picloram (4-amino-3,5,6-trichloropicolinic acid), as the potassium salt 2.3%
Inert Ingredients 97.7%
Picloram acid equivalent - 2.0%
E.P.A. Registration No. 464-333
E.P.A. Est. 464-MI-1

KEEP OUT OF REACH OF CHILDREN

CAUTION

AVISO:

PRECAUCION AL USUARIO:
Si usted no lee inglés, no use este producto hasta que la etiqueta le haya sido explicada ampliamente.

PRECAUTIONARY STATEMENTS

DUST CAUSES IRRITATION • MAY BE HARMFUL IF SWALLOWED

Avoid Skin and Eye Contact • Wash After Handling

Environmental Hazards

Keep out of lakes, ponds, and streams. • Do not contaminate water by cleaning of equipment or disposal of wastes.

NOTICE
Read the entire label. Use only according to label directions.
Before buying or using this product, read "WARRANTY LIMITATIONS AND DISCLAIMER" on back panel. If terms are not acceptable, return unopened package at once to seller for full refund of purchase price paid. Otherwise, use by the buyer or any other user constitutes acceptance of the terms under the Limit of Warranty and Liability.

IN CASE OF AN EMERGENCY

endangering life or property involving this product, call collect 517-636-4400

AGRICULTURAL CHEMICAL

Do Not Ship or Store with Food, Feeds, Drugs, or Clothing

TORDON* 2K

CONTENTS

FEDERAL (EPA) LABEL

TORDON 2K Pellets herbicide applied to the soil over plant roots is highly effective for the control of broadleaved perennial and annual weeds and undesirable woody plants on utility, highway and other right-of-ways, fencerows, headlands around farm and industrial buildings and storage sites.

USE DIRECTIONS

Do not use for manufacturing or formulating.

It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

For Control of Broadleaved Perennial and Annual Weeds: Apply TORDON 2K Pellets uniformly anytime during the normal growing season where sufficient moisture is available to carry the herbicide into the soil. In areas where little or no summer rainfall occurs, application should be made in late summer or early fall. Maximum effects of the treatment do not become apparent until the chemical has been carried by moisture into the soil.

TORDON 2K Pellets herbicide is effective against a wide range of weeds. Local conditions may affect the use of herbicides. Consult your State Agricultural Experiment Station or Extension Service weed specialists for local recommendations. Be sure that the use of this product conforms to all applicable regulations.

For Control of Woody Plants such as maple, locust, aspen, conifers, other woody trees, shrubs, wild rose, brambles, wild grapes and other vines, apply TORDON 2K Pellets uniformly to the soil over the root zone. Apply anytime during the normal growing season where sufficient moisture is available to carry the herbicide into the soil. In areas where little or no summer rainfall occurs applications should be made at "bud break" in late winter or early spring. Use at the rate of 300 to 400 pounds per acre (equivalent to approximately 7 1/2 to 10 lb per 1000 square feet, 2 to 2 1/2 lb per square rod, or 3/4 to 1 lb per 100 sq ft). Maximum effects of the treatment do not become apparent until the chemical has been carried by moisture into the soil in the root zone of the plants.

APPLICATION RATES

Weeds Controlled†	TORDON 2K Pellets — Amount to apply	Remarks
Docks Larkspur Pigweed Povertyweed Sowthistle (perennial) Sunflower Tansy Thistle (plumeless) Toadflax (dalmation)	50 to 100 lb. per acre 19 to 37 oz. per 1000 sq. ft 5 to 10 oz. per square rod	Use lower rates in low rainfall areas in the northern states such as Idaho, Montana, North Dakota, Oregon, South Dakota, Wyoming, and Washington. Higher rates should be used where rainfall is greater or in southern states such as Arizona, Arkansas, Kansas, Missouri, New Mexico, Oklahoma and Texas.
Bindweed (field) Bursage (bur ragweed woollyleaf povertyweed) Knapweed (Russian) Milkweed Spurge (leafy) Thistle (Canada)	100 to 150 lb. per acre 37 to 56 oz. per 1000 sq. ft. 10 to 16 oz. per square rod	

†These are typical examples of weeds controlled

USE PRECAUTIONS

Avoid Improper Application: This herbicide is highly active against most broadleaved plants. Small quantities may cause damage to plants whether applied during the growing or dormant season. Do not apply or otherwise permit TORDON 2K Pellets to contact desirable plants such as vegetables, flowers, grapes, fruit trees, ornamentals, cotton, beans, soybeans and other valuable broadleaved plants, nor the soil containing roots of such plants growing there on or nearby or where such plants are to be grown.

Avoid Water Contamination: To avoid crop or other plant injury, do not treat inner banks or bottom of irrigation and drainage ditches. Do not contaminate water to be used for drinking or other domestic purposes.

Avoid Movement of Treated Soil: Avoid the movement of treated soil into untreated areas.

Other Precautions: Do not store near food, feedstuffs, fertilizer, seeds, insecticides, fungicides or other pesticides. To avoid injury to desirable plants, containers and equipment used for TORDON 2K Pellets should not be re-used to contain or apply other materials.

Do Not Mix or Blend with Fertilizers.

STORAGE AND DISPOSAL

Do not contaminate water, food or feed by storage or disposal.

PESTICIDE DISPOSAL: Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility.

CONTAINER DISPOSAL: Refer to instructions on container for proper disposal information.

MONTANA ..... **EPA SLN No. MT-800011**

For the Control of Susceptible Broadleaf Weeds and Woody Plants on Rangeland, Forests, and Permanent Grass Pastures

DIRECTIONS FOR USE

It is a violation of Federal law to use this product in a manner inconsistent with its labeling

TORDON 2K Pellets Herbicide is designed for application to soil for control of susceptible herbaceous and woody plants by absorption through root pick-up.

Rainfall is needed after application to leach the picloram to the roots. Application can be made by hand or broadcast equipment. Generally uniform distribution over the root-zone of the plants in the intended site is desirable; however, certain species may be controlled by concentrating the dose near the stem. Best results are usually obtained when rain follows shortly after application and shortly before or during active growth. Do not apply TORDON 2K Pellets to frozen or saturated soil.

SUGGESTED USE RATES

	lb/A	oz/100 sq. ft.
Yellow starthistle, Scotch thistle, musk thistle, spotted and diffuse knapweeds, lupines, locoweeds	25-50	1-2
Rush skeletonweed, Russian kanpweed, Canada thistle, Tall larkspurs, rabbitbrush, burrowweed, snakeweed, fringed sagebrush, common milkweed, artichoke thistle, tansy ragwort, common tansy, pricklypear and cholla cacti.	50-100	2-4
Leafy spurge	100-150	4-6

TORDON 2K Pellets Herbicide at rates over about 75 lb per acre may suppress certain grasses, such as wheatgrass, bromegrass, buffalograss and bluegramma. Usually, later grass growth will be improved by release from competition. Grass seedlings may be suppressed or killed up to 2 years after application at higher rates. Broadleaf forage plants, especially legumes, in treated areas may be injured or killed and may not grow for 1 to 2 years

RESTRICTIONS FOR PASTURE AND RANGELAND USE

Limit coverage to no greater than 25% of an applicators acreage found in any particular watershed

Do not use where a sandy porous surface and substrate overlie ground water closer than 10 feet below the surface

Where watersheds have significant slope and where rapid runoff can occur, use spot treatment only. Do not apply within 1/2 mile of where stream or pond water which drains from the treated watershed may be drawn to irrigate susceptible broadleaf crops, especially beans and potatoes. Do not clean containers or application equipment on or near these areas

Kill or injury may occur to desirable forbs, trees or shrubs, such as blackberry, cherry, locust, poplar, mountain mahoganey, bitterbrush and sumac, from root uptake. If such effects cannot be tolerated, do not apply on or near such desirable plants

Do not apply to cropland used for production of desirable crops other than forage species. Do not rotate treated rangeland or pastures to other crops until residues of picloram have reached a nonphytotoxic level. Forage legumes on the treated areas may be injured and may not grow for two years or more after treatment

Read and follow all other use precautions on this label

USE PRECAUTIONS

Apply this product only as specified on this label. The active ingredient in TORDON 2K Pellets herbicide is water soluble and should not be applied where surface water from treated areas can run off to croplands either planted or to be planted

Avoid use near desirable plants. This herbicide is water soluble, highly active and can remain in the soil for more than one growing season. Very small amounts can injure broadleaf plants such as potatoes, peas, beans, sugar-beets or alfalfa; therefore, do not apply on or near these or other susceptible plants, ornamentals, shade trees or vegetable crops. Do not plant these crops or plants in soil that may have injurious amounts of this herbicide

Avoid movement of treated soil. Picloram may remain in treated soil for an extended period. Do not move treated soil to other areas and do not use such soil to grow plants until residues have reached a non-phytotoxic level.

Avoid transfer of livestock from a treated area to a broadleaf crop area without first allowing 7 days of grazing on untreated pasture for the first 12 months after application. Otherwise, urine may contain enough picloram to cause injury to sensitive broadleaf plants. Do not use manure from animals grazing treated areas to fertilize soil or fields used to grow susceptible broadleaf crops.

Avoid water contamination. Do not allow TORDON 2K Pellets herbicide to contaminate water used for drinking, irrigation or other domestic purposes. Do not apply on inner banks or bottoms of irrigation ditches. Do not clean containers or application equipment on or near these areas

Avoid improper storage and equipment use. Do not store near fertilizers, seeds, insecticides, fungicides or other pesticides. Containers and equipment used for TORDON 2K Pellets herbicide should not be used for other agricultural chemicals since small residues of TORDON 2K Pellets herbicide can damage desirable plants

Avoid improper disposal. Rinse equipment and dispose of waste by burying in non-cropland away from water supplies. Do not reuse containers. Bury them with waste or dispose in a sanitary landfill or follow official container disposal regulations.

Be sure that use of this product conforms to all applicable state and federal regulations.

WILBUR-ELLIS

AMINE 4

2,4-D AMINE HERBICIDE

ACTIVE INGREDIENT Dimethylamine Salt of 2,4 Dichlorophenoxyacetic Acid	46.7%
INERT INGREDIENTS	53.3%
TOTAL	100.0%

Equivalent to 38.8% of 2,4 Dichlorophenoxyacetic acid or 3.8 lb/gal
Isomer specific by AOAC Method 6.275, 13th Ed. 1980

EPA REGISTRATION NO 39511-64-2935
EPA ESTABLISHMENT NO (SEE CONTAINER)

READ ENTIRE BOOKLET BEFORE USING THIS PRODUCT
SEE CONTAINER FOR ADDITIONAL PRECAUTIONARY STATEMENTS, STORAGE AND DISPOSAL AND FIRST AID INFORMATION.

STORAGE AND DISPOSAL

STORAGE: Do not contaminate water, food, or feed by storage or disposal. Open dumping is prohibited. Do not store this product near fertilizers, seeds, insecticides, or fungicides. Containers should not be stacked more than six (6) high. Reclose all partially used containers by thoroughly tightening screw cap. Damaged or leaking containers which cannot be closed immediately should be transferred to suitable sound containers and properly marked. Absorb any spill with a suitable clay absorbant and dispose of as indicated under "Pesticide Disposal"

For safety and prevention of unauthorized use, all pesticides should be stored in locked facilities.

To prevent accidental misuse, different pesticides should be stored in separate areas with enough distance between to provide clear identification.

Opened, partially used pesticides should be stored in original labeled containers when possible. When transfer to another container is necessary because of leakage or damage, carefully mark, and identify contents of the new container.

PESTICIDE DISPOSAL: Pesticide wastes are toxic. Improper disposal of excess pesticide, spray mixture, or rinsate is a violation of federal law. If these wastes cannot be disposed of by use according to label instructions, contact your State Pesticide or Environmental Control Agency or the Hazardous Waste representative at the nearest EPA Regional Office for guidance.

CONTAINER DISPOSAL: Container disposal instructions vary with type of container used for packaging product. See actual container label for complete container disposal instructions.

DIRECTIONS FOR USE

It is a violation of Federal Law to use this product in a manner inconsistent with this labeling.

REENTRY STATEMENT. Do not enter treated areas without protective clothing until sprays have dried. Protective clothing should include: hat or other suitable head covering, long sleeved shirt and long legged trousers, or a coverall type garment, shoes, and socks.

Because certain states may require more restrictive reentry intervals for various crops treated with this product, consult your State Department of Agriculture for further information.

Written or oral warnings must be given to workers who are expected to be in a treated area or in an area about to be treated with this product. The front panel PRECAUTIONARY STATEMENTS should be read to workers as well as the instruction not to enter until sprays have dried. When oral warnings are given, warnings shall be given in language customarily understood by workers. Oral warnings must be given if there is reason to believe that written warnings cannot be understood by workers. Written warnings must include the following information:

CAUTION: Area treated with 2,4-D on (date of application). Do not enter without appropriate protective clothing until sprays have dried. (insert here Statements of Practical Treatment as on front panel.)

GENERAL INFORMATION

Performance of this product may be affected by local conditions, crop varieties, and application method. User should consult local extension service, agricultural experiment, or university weed specialists, and state regulatory agencies for recommendations in your area.

Best results are obtained when product is applied to young succulent weeds that are actively growing. Application rates lower than recommended will be satisfactory on susceptible annual weeds. For perennial weeds and conditions such as the very dry areas of the western states, where control is difficult, the higher recommended rates should be used.

When product is used for weed control in crops, the growth stage of the crop must be considered.

Some plants and weeds, especially woody varieties, are difficult to control and may require repeat applications. Application rates should be 1 to 5 gallons of total spray by air or 5 to 25 gallons by ground equipment unless otherwise directed. In either case, use the same amount of 2,4-D recommended per acre. For crop uses, do not mix with oil, surfactants, or other adjuvants unless specifically recommended on label. To do so may reduce herbicides selectivity and could result in crop damage.

Aerial application should be used only when there is no danger of drift to susceptible crops. Many states have regulations concerning aerial application of 2,4-D formulations. Consult local regulatory authorities before making applications. This product contains the Dimethylamine salt of 2,4-D, one of the least volatile forms of 2,4-D. Vapors released by this product are insufficient to cause damage to adjacent susceptible crops.

Because coarse sprays are less likely to drift than fine, do not use equipment (such as hollow cone small orifice nozzles) or conditions (such as high pressure) that produce such sprays.

Product should not be allowed to come into contact with desirable, susceptible plants such as beans, cotton, fruit trees, grapes, legumes, ornamentals, peas, tomatoes, and other vegetables. Product should not be used in greenhouses. Excessive amounts of this product in the soil may temporarily inhibit seed germination and all plant growth.

Users should note that herbicide treatment of public water requires a permit from appropriate state agencies in most states. Your state Conservation Department, or Game and Fish Commission will aid you in securing a permit in your state

If stored below freezing, it may be necessary to warm product to 70°F and agitate before using. This does not affect the efficiency of the product

Spray equipment used to apply 2,4-D should not be used for any other purpose until thoroughly cleaned with a suitable chemical cleaner

Spray Preparation: Add the recommended amount of product to approximately one-half the volume of water to be used for spraying. Agitate well, then add the remainder of the water. Continue agitation during application until spray tank is empty.

Use in Liquid Nitrogen Fertilizer: Product may be combined with liquid nitrogen fertilizer suitable for foliar application of corn, grass, pastures, or small grains in one operation. Use product according to directions on this label for those crops. Use liquid nitrogen fertilizer at rates recommended by supplier or extension service specialist. Mix the product and fertilizer according to the following instructions:

Fill the spray tank approximately ½ full with the liquid nitrogen fertilizer.

In a separate clean container, mix the amount of product to be used with an equal amount of water. Add the product mixture to the spray tank while agitating. Add the remainder of the fertilizer while continuing to agitate. Apply immediately maintaining agitation during application until tank is empty. DO NOT APPLY DURING COLD (NEAR FREEZING) WEATHER. Spray mixture must be used immediately and may not be stored.

NOTE: Pre-mixing the product with an equal amount of water is important.

WHERE TO USE

This product is used to control broadleaved weeds in cereal crops, corn, sorghum, weeds and brush in rangeland, pastures, rights-of-way, and similar noncrop uses, tree injection, and for aquatic weed control.

CORN: See table for recommended use rates.

Preemergence: Apply product from 3 to 5 days after planting but before corn emerges. Do not use on very light, sandy soils. Use the higher rates on heavy soils. Plant corn as deep as practical.

Post Emergence. Best results are usually obtained when weeds are small and corn is 5 to 18 inches tall. When corn is over 8 inches tall, use drop nozzles. Do not apply from tasseling to dough stage. If corn is growing rapidly and temperature and soil moisture content is high, use ½ pint per acre rate to reduce possibility of crop damage. Delay cultivation for 8 to 10 days to prevent stalk breakage due to temporary brittleness caused by 2,4-D. Application rates of up to 1 pint/acre may be used to control some hard to control weeds. However, the possibility of injury to the corn is increased.

If corn is over 8 inches tall, use drop nozzles to keep spray off corn foliage as much as possible. Do not use with oil, atrazine, or other adjuvants. Since the tolerance to 2,4-D of individual hybrids varies, consult your local Extension Service, Agricultural Experiment Station, or University Weed Specialist for information.

Pre-Harvest: After the hard dough or denting stage, apply 1 to 2 pints of product per acre by air or ground equipment to suppress perennial weeds, decrease weed seed production, and control tall weeds such as bindweed, cocklebur, dogbane, jimsonweed, ragweed, sunflower, velvetleaf, and vines that interfere with harvesting. Do not forage or feed corn fodder to livestock for 7 days following application.

SORGHUM (Milo): See table for recommended rate. Apply to sorghum when crop is 4 to 12 inches high with secondary roots well established. Use drop nozzles when crop is over 10 inches high. Do not apply from flowering to dough stage. Rates of up to 1 pint per acre may be used to control some hard to control weeds. However, the chance of crop injury is increased with the higher rates. Do not use with oil. Use lower rate if conditions of high temperature and high soil moisture exist.

PLANTS CONTROLLED

Product will kill or control the following in addition to many other noxious plants susceptible to 2,4-D: arrowhead, artichoke, bindweed (hedge, field, and European), bitter wintercress, box elder, buckhorn, bull thistle, bulrush, burdock, burragweed, ground ivy, hemp, hoary cress, honeysuckle, indigo, ironweed, jimsonweed, lambsquarters, lotus, coweed, Mexican weed, morningglory, mustard, parrot feather, pennywort, pigweed, plantain, poison ivy, pokeweed, povertyweed, puncturevine, Canada thistle, catnip, chickweed, chickory, cocklebur, coffee bean, creeping jenny, curley indigo, duckweed, elderberry, golden rod, puncture vine, purslane, rush, Russian thistle, sagebrush, sheepherdspurse, smartweed, sow thistle, stinkweed, sumac, sunflower, Virginia creeper, water hyacinth, water lily, water primrose, wild garlic, wild lettuce, wild onion, wild radish, willow, wiltcheese

CROPS:

SMALL GRAINS NOT UNDERSEEDED WITH A LEGUME (BARLEY, OATS, WHEAT, RYE): See table for recommended use rates.

Spray when weeds are small after grain begins tillering but before boot stage (usually 4 to 8 inches tall). Do not apply before the tiller stage nor from early boot through milk stage. To control large weeds that will interfere with harvest or to suppress perennial weeds, preharvest treatment can be applied when the grain is in the dough stage. Best results will be obtained when soil moisture is adequate for plant growth and weeds are growing well.

Spring Planted Oats: Apply in sufficient water to give good coverage. Apply after the fully tillered stage, except during the boot to dough stage.

Fall Planted Oats: Apply after full tillering but before early boot stage. Some difficult weeds may require higher rates of 1 to 1¼ pints per acre for maximum control, but injury may result. Do not spray during or immediately following cold weather.

Note: Oats are less tolerant to 2,4-D than wheat or barley and more likely to be injured. Do not forage or graze treated grain fields within 2 weeks after treatment with 2,4-D. Do not feed treated straw to livestock.

RICE: See table for recommended rate. Apply the product in sufficient water to cover one acre when weeds are in active growth stage. Rice plants are sensitive to 2,4-D in early stages of growth; therefore, it is advisable to delay spraying until the second or third week after flooding. Water in the field should be shallow enough to permit direct application of the spray material to the weeds. Make all treatments well in advance of heading.

SUGARCANE: See table for recommended rate. Apply as a pre- or post-emergent spray in the spring after canes emerge and through lay-by. Consult local Agricultural Experiment or Extension Service Weed Specialists on specific use of this product, or in combination with Dow pon M, to control broadleaved and grass weeds.

RECOMMENDED RATE OF AMINE 4 PER ACRE

Crop	Dosage Per Acre** Normal Rates (usually safe to crop)	Higher rates for Special Situations* (more likely to injure crop)
Small Grains:		
Spring Postemergence wheat, barley, rye oats	2/3 to 1 1/3 pints ½ to 1 pint	2 to 3 pints 1½ to 2 pints
Preharvest (dough stage) wheat, barley oats	1 to 2 pints	2 to 3 pints
Corn Preemergence Emergence Postemergence up to 8 inches tall 8 inches to tasseling (use only directed spray) Preharvest	2 to 4 pints 1 pint ½ to 1 pint 1 pint 1 to 2 pints	1½ pints
Sorghum Postemergence 6 to 8 inches tall 8 to 15 inches tall (use only directed spray)	2/3 to 1 pint 1 pint	1½ to 2 pints
Rice	1 to 2½ pints	2 to 3 pints
Sugarcane	2 to 4 pints	

* The higher rates as recommended above may be necessary to control the tall weed grass areas such as dry conditions of the Western States. They should not be used, however, unless possible crop injury is acceptable. User should consult local extension service or Agriculture Experiment Station Weed Specialist for recommendations on special conditions

** Arizona Idaho Montana Nevada Oregon Utah Washington Wyoming

*** If band treatment is used base the dosage rate on the actual area sprayed

ORNAMENTAL TURF: Use 1 to 3 pints of product in enough water to give good coverage to one acre on established stands of perennial grasses, depending on type of weeds and stage of growth. Do not use on creeping grasses such as Bent except for spot spraying. Newly seeded turf should not be treated until after the second mowing and the lower dosage rate should be used

GRASS SEED CROPS: Apply 1 to 4 pints of product per acre in the Spring or Fall to control broadleaf weeds in grass being grown for seed. Do not apply from early boot to milk stage. Spray seedling grass only after the five leaf stage, using ½ to 1 pint per acre to control small seedling weeds. After the grass is well established, higher rates of up to 4 pints per acre can be used to control hard to kill annual or perennial weeds. For best results, apply when soil moisture is adequate for good growth. Do not use on Bent unless injury can be tolerated. Do not graze dairy animals nor cut forage for hay within 7 days of application.

FALLOW LAND: On established perennial species such as Canada thistle and Field bindweed, apply up to 3 quarts of product per acre. For annual broadleaf weeds, apply 1 to 2 quarts per acre. Do not plant any crop for 3 months after treatment or until 2,4-D has disappeared from soil

ESTABLISHED PASTURES AND RANGELANDS: Use 1 to 4 pints of product in sufficient water to give good coverage to one acre depending on type of weeds and stage of growth. Use only on established stands of perennial grasses. DO NOT graze dairy animals nor cut forage for hay within 7 days of application

For control of annual and perennial broadleaf weeds, apply 1 to 2 quarts of product per acre in approximately 20 to 100 gallons of total spray. Treat when weeds are young and actively growing before the bud or early bloom stage. For harder to control weeds, a repeat spray may be needed after 3 to 4 weeks for maximum results, using the same rates.

Apply no more than 2 treatments per season. For woody brush and patches of perennial broadleaf weeds, mix one gallon of product in 150 gallons of water. Wet foliage thoroughly, using approximately 1 gallon of spray solution per square rod.

Spraying Instructions: Low pressure (10 to 40 psi) power spray equipment should be used and mounted on a truck, tractor, or boat. Apply while traveling upstream to avoid accidental concentration of chemical into water. Spray when the air is calm, 5 mph or less. Do not use on small canals (less than 10 CFS) where water will be used for drinking purposes.

Boom spraying onto water surface must be held to a minimum and no cross-stream spraying to opposite banks should be permitted. When spraying shoreline weeds, allow no more than 2-foot overspray onto water with an average of less than one-foot overspray to prevent introduction of greater than negligible amounts of chemical into the water.

Do not allow dairy animals to graze on treated areas for at least 7 days after spraying. Water within treated banks should not be fished.

FOR AQUATIC WEEDS IN LAKES, PONDS, DRAINAGE DITCHES, AND MARSHES: Use 2½ to 4½ pints of product in 50 to 100 gallons of water per acre. Spray to wet foliage thoroughly. Application should be made when leaves are fully developed above water line and plants are actively growing. Your State Conservation Department or Game and Fish Commission will assist you in determining the best time and rate for application under local conditions.

DO NOT APPLY to more than 1/3 to 1/2 of a lake or pond in any one month because excessive decaying vegetation may deplete oxygen content of water, and kill fish.

Do not contaminate water used for irrigation or domestic purposes.

Perennial and other hard to control weeds may require a repeat application to give adequate control.

GENERAL WEED CONTROL (Railroads, Roadsides, Vacant Lots, Drainage Ditch Banks, Fence Rows, Industrial Sites and similar areas): Use 1 to 3 quarts of product per acre. Usually 2 quarts per acre will give adequate control. Do not use on herbaceous ground covers or creeping grass such as Bent. Legumes will usually be damaged or killed. Deep-rooted perennials may require repeat applications. Do not use on freshly seeded turf until grass is well established. Delay reseeding for 3 months or until 2,4-D has disappeared from soil.

WOODY PLANT CONTROL: To control woody plants susceptible to 2,4-D, such as alder, buckbrush, elderberry, sumac, and willow on non-crop areas, use 2 to 3 quarts of product per acre in 100 gallons of water. Wet all parts of the plants thoroughly, including stem and foliage, to the point of run off. Higher volumes of up to 400 gallons per acre are necessary where the brush is very dense and over 6 to 8 feet high. Applications are more effective when made on actively growing plants. Treatment should not be made during time of severe drought or in early Fall when leaves lose their green color. Hard to control species may require re-treatment next season.

TREE INJECTION: For the control of unwanted hardwoods such as elm, oak, hickory, and sweetgum in forest and other non-crop areas, apply undiluted product by injecting 1 ml through the bark, using one injection per inch of trunk diameter measured at breast height (4½ feet). For harder to control species (ash, maple, dogwood), use 2 ml of undiluted product per injection. All injections should be as near the root collar as possible and should be evenly spaced around the trunk. Injections may be made at any time of the year but are most effective during the growing season. Maples should not be treated during the spring sap rise.

AQUATIC APPLICATIONS

WEEDS AND BRUSH ON IRRIGATION CANAL DITCHBANKS—*Seventeen Western States*: Arizona, California, Colorado, Idaho, Kansas, Montana, Nebraska, New Mexico, Nevada, North Dakota, Oklahoma, Oregon, South Dakota, Texas, Utah, Washington, Wyoming

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June 3, 1986

Chuck Sundt
Gallatin National Forest
Bozeman Ranger District
601 Nickles - Box C
Bozeman, MT 59715

Dear Chuck:

Please find enclosed information on sensitive, threatened, and endangered plant species on the Gallatin National Forest. Eight species are currently known to occur on N.F. land, and information about seven of these is summarized in a copy of the rare plant information taken from The Nature Conservancy Field Office's comments on the Forest Plan. Additionally, 24 species are listed which have been reported from Gallatin, Madison, Park, and Sweet Grass counties. Additional field surveys would be needed to reveal the presence of these, or other, sensitive plants on the Gallatin N.F.

The eight species listed first occur at higher elevations, and thus may not be quite so subject to actions proposed in the draft noxious weed EIS. However, the most efficient way to assess possible impacts is to review the draft list of locations (legals) to be treated. I would appreciate a copy of the EIS for our office when it becomes available.

Also enclosed is a computer print-out of a special plant location on the Gallatin from our data base, to illustrate the information we store; and a copy of the special plant list I have drawn up for the program. As our inventory is so new, and our data base is hence still small, this information is subject to change. You will note that some ranks (defined in the plant list) have been changed from those given in the TNC information.

Please be sure to call if you have questions or need further information.

Sincerely,

Steve Shelly

J. Stephen Shelly
Botanist

RARE PLANTS ON THE GALLATIN NATIONAL FOREST

1. Erigeron flabellifolius (Fan-leaved daisy) G3/S1

Status: Listed by The Nature Conservancy as threatened globally and critically endangered in Montana. Listed as "rare" by the Montana Rare Plant Project. Regional endemic, known from eight locations in Montana.

Habitat: Talus slopes and gravelly soil above timberline, 9,000-11,000' in the Beartooth and Crazy Mountains.

Location: a) Crazy Mountains, north of Sunlight Lake (NW 1/4 Sec. 8, T4N, R11E). Common in open gravelly soil or exposed sites, especially east facing slopes. b) Absaroka Range, West Boulder Plateau (NE 1/4 Sec. 12, T5S, R11E). A few plants located between coarse talus and the summit.

Management Recommendations: Sunlight Lake site needs to be assessed for present and future threats from recreationists. Protection measures may be necessary to protect the populations from motorized vehicle abuse or trampling. The West Boulder Plateau site is probably adequately protected by wilderness designation.

2. Townsendia condensata (Cushion townsendia) G3/S1

Status: Listed by The Nature Conservancy as threatened globally and critically endangered in Montana. Listed as "rare" by Montana Rare Plant Project. Small populations, known from only two mountain ranges in the state.

Habitat: Rocky soil or talus above timberline, lower on limestone.

Location: Reported on the Montana-Wyoming border, south of Cooke Guard Station, nw slope of "Ram Pasture"(?) above timberline.

Management Recommendations: This herbarium report has not been field checked by TNC staff, and we are unable to determine the exact location from this description. The site needs to be verified and assessed for present and future threats.

3. Draba apiculata ~~var. apiculata~~ (Pointed draba) G3/S2

Status: Listed by The Nature Conservancy as globally threatened and endangered in Montana. Listed as "rare" by the Montana Rare Plant Project. Peripheral, known only from Madison County.

Habitat: Open ground above timberline, often on limestone in the Madison Mountains..

Location: Madison Range, east end of Taylor Basin (Sec. 23, T9S, R2E). Open frost-churned ground at the edge of a snowbank, limestone parent, 10,000'.

Management Recommendations: Protected by wilderness designation and inaccessibility. Notify staff to be on watch for more occurrences.

4. Draba ventosa (Wind River draba)

Status: Listed as "rare" by Montana Rare Plant Project. Two known occurrences in state. Little information available.

Habitat: Rock ledges and talus slopes above timberline, often on limestone.

Location: Madison Range, 1/2 mi. north of Koch Peak, on a talus slope of a mountain on the east side of Koch Basin.

Management Recommendations: Protected by wilderness designation and inaccessibility. Notify staff to watch for more occurrences.

5. Physaria saximontana var. dentata (Mountain twinpod) G3/S3T3

Status: This subspecies is listed by The Nature Conservancy as threatened globally and in Montana. Recently split from Physaria didymocarpa. Apparently a state endemic, but rare plant experts believe it may be more widespread than current information indicates.

Habitat: Open soil, often rocky and often calcareous on slopes and ridgetops at lower to high elevations.

Location: Crazy Mountains, near Sunlight Lake Mountain. Not visited by TNC staff.

Management Recommendations: Site needs to be verified, and current and future threats assessed. Presence of two rare plants in the Sunlight Lake area warrants considering designation as an RNA or special botanical area.

6. Erigeron gracilis (Slender fleabane) G4/S1

Status: Listed by The Nature Conservancy as apparently secure globally but critically endangered in Montana. Listed as "rare" by The Montana Rare Plant Project. Regional endemic. Four known occurrences in Montana.

Habitat: Meadows and open slopes at mid-to high elevations in the Absaroka Mtns.

Location: West Boulder Plateau a) NE 1/4 Sec. 12, T5S, R11E; small, dry meadow on north slope at 9,900'. b) Sec. 1, T5S, R11E; upper east slope of the plateau at 9,900'.

Management Recommendations: Wilderness designation probably is adequate protection. Presence of two rare plant species in the West Boulder Plateau area suggests consideration of special designation as a botanical area or RNA.

7. Potentilla brevifolia (Short-leaved cinquefoil) G4/S1

Status: Listed by The Nature Conservancy as apparently secure globally but critically endangered in Montana. Listed as "rare" by The Montana Rare Plant Project. Peripheral, common in WY, NEV, ID. Only one known occurrence in Montana.

Habitat: Open, rocky slopes above timberline.

Location: Madison Range (Sec.15, T10S, R2E). Ridge running south from Expedition Pass ca. 20 mi. nw of West Yellowstone, east facing slope at 10,000'.

Management Recommendations: Protected by wilderness designation. Notify staff to watch for more occurrences.